AUG 11 1990

629-E

I 53.22/10:5

U.S. Department of the Interior
Bureau of Land Management

Oregon State Office
Box 2965
Portland, Oregon 97208

1990

A Cultural Resource Overview for the 1990's, BLM Prineville District, Oregon

Clayton G. Lebow, Richard M. Pettigrew, Jon M. Silvermoon, David H. Chance, Robert Boyd, Yvonne Hajda, and Henry Zenk

Cultural Resource Series No. 5

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

BLM-OR-AE-90-47-1792

A CULTURAL RESOURCE OVERVIEW FOR THE 1990s, BLM PRINEVILLE DISTRICT, OREGON

VOLUME I

by

Clayton G. Lebow, Richard M. Pettigrew, Jon M. Silvermoon,
David H. Chance, Robert Boyd, Yvonne Hajda, and Henry Zenk

prepared for

Bureau of Land Management, Prineville District
P.O. Box 550
Prineville, Oregon 97754

In partial fulfillment of Contract No. OR952-RFP9-307B

INFOTEC Research, Inc.
205 West Fifth Street
Eugene, OR 97401

May 12, 1990

IRI Report No. PNW90-1

I

FOREWARD

This report describes the current status of BLM's cultural resources management program in north central Oregon. Since the initial overview was completed in the late 1970s, many archaeological field surveys have been completed and additional information has accumulated. The District lies primarily in the southern Columbia Plateau portion of the Columbia River drainage system, a region poorly known archaeologically relative to the Great Basin province to the south. However, it is also a region for which a great deal of Native American interest exists as demonstrated by the active roles that many of the Columbia River region Indian tribes have assumed in resource management issues during the 1980s. Consequently, the proper management of cultural resources in the area has gained increased importance.

In this report, Volume 1 which contains the narrative portion of the report is presented in its entirety. However, only the introduction section to Volume 2 is provided due to the sensitive site location information contained in the remainder of that volume.

It is intended that issues and problems identified by this study will contribute to further enhancement of the cultural resources program for the Prineville District.

Richard C. Hanes
Series Editor

Cover Photo: Suzanne Crowley Thomas, former archaeologist for the Prineville District, recording an aboriginal juniper structure site.

ABSTRACT

This report, compiled by INFOTEC Research, Inc., for the USDI Bureau of Land Management (BLM), is an updated overview of cultural resources on the Prineville District. The primary objective is to provide management guidance for the District during the 1990s, and thus focus on land use patterns and site distributions. Data utilized in this compilation are derived from a dBASE IV computer file of all the cultural resource sites recorded on the District, interviews with knowledgeable persons, ethnographic notes from Warm Springs Native American informants, and inspection of pertinent literature and archival records. The reliability of the computer file data is analyzed, and found to be quite variable in quality and content. Review and examination of ethnograpic, archaeological, and historic information reveals that human use in the District has been highly variable for the last 12,000 years. Analysis of the relationship between human land use and environmental variables indicates that many distributional patterns are apparent in the data. The cultural resource sites recorded on the District are assigned provisionally to BLM-defined resource use categories. Directions for future research are examined in the context of two theoretical domains, specific hypotheses are presented, and methods applicable to addressing the research topics discussed. Specific management guidance is provided, including a proposed list of prioritized actions. The bibliography includes not only references cited, but also all substantial literature pertaining to the District. The second volume consists of a printed version of the site forms encoded onto the dBASE IV computer file.

MANAGEMENT SUMMARY

This report presents an updated overview of cultural resources and their values, conducted by INFOTEC Research, Inc. (IRI), for the Prineville District of the USDI Bureau of Land Management (BLM). The primary objective of the work is to provide new guidance for management activities within the Prineville District in the 1990s. In reaching this objective, the overview brings together for the first time a wide variety of information on ethnography, prehistoric archaeology, and history, creates a framework for interpretation, and outlines orientations for future research. Data for this overview were compiled from a variety of sources, including interviews with knowledgeable persons, visits to key sites, inspection of archival records, examination of ethnographic notes derived from Warm Springs Native American informants, and computer manipulation of data from 903 site records on file with the Prineville District. These site records were encoded by IRI in a dBASE IV computer file.

Study of cultural resources resulted in the two volumes presented. Volume I contains the data presentation, analyses, and discussions, as well as the management recommendations and bibliography. Volume II includes the Appendix, comprising printed versions of the site records.

The quality of data in the computerized database shows improvement in site records over time, with records tending to be somewhat more complete in more recent times. Information on site location and integrity often are missing, and usually distinctions between surface and subsurface integrity are not made. Sites are defined differently for different projects, and the assignment of site types is plagued by definitional ambiguity and inflexibility. Important descriptive terms often are used inconsistently. Some variability in data quality is seen between BLM and non-BLM recorders, and between site records and survey reports. Particularly for sites recorded before 1980, ground-truthing appears necessary. The data appear biased by variable survey approaches, and reflect changing research orientations.

Ethnographic information for the study area, though traditionally grouped in terms of culture areas or other large categories, seems best presented in terms of subsistence rounds, settlement patterns, and social ties as manifested in material remains. In terms of subsistence resources, a separation between the northern area, with its salmon streams, and the southern part seems useful, though the two areas had much in common, especially plant foods and land mammals. Generally, fishing is more important in the north, and hunting in the south. Following this difference, the north possessed a more sedentary settlement system, with winter occupation sites containing relatively substantial dwellings, while the limited information from the south suggests smaller, less fixed winter sites with mobile lodges.

The prehistoric record is very incomplete, but a proposed model divides it into four informal cultural periods: (1) Paleo-Indian (12,000-10,500 B.P.), represented by fluted points; (2) Early Archaic (10,500-7000 B.P.), marked by large, stemmed lanceolate as well as foliate points; (3) Middle Archaic (7000-2000 B.P.), associated with broad-necked, notched, triangular points; and (4) Late Archaic (2000 B.P.-contact), indicated by smaller narrow-necked, notched, triangular points believed to mark the introduction of the bow-and-arrow by 2000 B.P. Evidence for Paleo-Indian occupation is very scant, as it should be if the proposed

model is correct. The model suggests that these early people focused on large herd mammals, foraged widely over the terrain, not developing detailed knowledge of local and more fixed resources, and re-used base camps infrequently, thus leaving behind a very limited archaeological record. Early Archaic times are somewhat better represented, but not so much as to make land-use patterning clear. The model characterizes Early Archaic adaptation as a continuation of earlier foraging, but with expansion of the subsistence base to include a much wider variety of animals within more restricted territories. Plant use was not intensive. Bands remained small and integrated at the family level, and population densities were low except in favorable locations, such as the northern Great Basin, where abundant food resources could be procured year-round. Ready access to game was necessary because food-storage technology was not yet well developed.

Evidence of land use in the Middle Archaic is much better represented in the record. Sites of the period are present everywhere, and include for the first time indications of a well organized logistical system based on central winter occupation sites and food storage facilities. The proposed model holds that development of this system was necessitated first by the climatic deterioration of the mid-Holocene, when important game became much less abundant. This condition stimulated the development of techniques to hunt solitary game animals with notched projectile points, and to invest in the labor-intensive and expanded use of dryland seeds and roots, which were processed most efficiently with grinding stones. At the same time, where salmon were available, increased fishing would have been very adaptive. Thus was created a new economy in which stored foods allowed people to take up a logistical system with a central home base, even in areas formerly marginal because of seasonal scarcity. According to the model, the latter half of the Middle Archaic in the north saw intensification of the salmon resource in response to population growth. This intensification continued well into the Late Archaic. Indeed, the archaeological record appears to show greatest human activity in the late Middle Archaic and Late Archaic periods.

The historical period in the Pacific Northwest begins at about 1775, but first Euro-American contact in the Prineville District came with Lewis and Clark in 1805. Most Euro-Americans in the study area were temporary residents until the 1860s, when gold was discovered, and intensive settlement began in 1868 with the end of the Snake Indian War. Early settlers made a living by cattle and sheep ranching and small-scale agriculture. The arrival of the railroad in the 1880s linked the area to the national economy, and more intensive settlement of Central Oregon began in the first decade of this century with the construction of large-scale irrigation projects and the arrival in 1911 of the Oregon Trunk Line railroad. Population increased dramatically at this time, only to fall just as suddenly during the hard times of the 1930s Depression, when world-wide economic collapse conspired with unusually dry weather.

Examination of the relationship between human land use and environmental variables in the study area reveals a variety of patterns. Prehistorically, midden sites (mostly shell middens) clearly correlate with the lower Deschutes River, possibly because of especially good habitat for freshwater mussels. The Lower Deschutes sub-basin also has the highest incidence of prehistoric rock feature sites, commonly associated with talus slopes. Open sites (usually with housepits) and shelters/cave sites are more common in the John Day basin than elsewhere, and in both the Deschutes and John Day basins are more common in the lower than the upper sub-basins. Rock art sites are most frequent in the Middle Deschutes sub-basin. Quarry sites, possibly because of data from the Glass Buttes area, are most common in the Goose-Summer Lakes basin. Prehistoric artifact scatters (or "lithic scatters") are the most common site type, found on a wide variety of landforms. Artifact scatters proportionately occur more frequently to the south and at higher elevations.

For historic sites, less distributional patterning exists than for prehistoric sites. Architectural structures are much more common in the John Day basin than elsewhere, frequently within canyons. Canyon slopes are the most common settings for engineering structures, which tend to be relatively more frequent in the lower sub-basins of the Deschutes and John Day river basins. Historic artifact scatters exhibit a tendency to be relatively more frequent in the upper than in the lower sub-basins, but have relatively little correlation with specific landforms.

A review of the available literature on site-distribution patterns shows a good deal of agreement with the patterns gleaned from the database, with only one notable exception: shell appears to exist at sites along the John Day as well as the Deschutes River. Prehistoric artifact scatters, the most common site type, exhibit the lowest tendency to correlate with specific environmental variables, suggesting a wide range of functions.

Assignment of sites to BLM resource use categories was made only provisionally, because of the seriously limited information available from the site forms, and the rarity of excavations: only 18 sites in the database have had any test excavation, mostly without National Register criteria in mind. Also, most site records are many years old, and may not represent current conditions. For the resource use categories, specific sites are discussed, as well as criteria to be applied when ultimate assignments are made.

Research topics applicable to the Prineville District, numerous and generally familiar to cultural resource specialists, are inspired by theory and general knowledge as much as by information from north-central Oregon. Two theoretical domains, "Socio/Political/Economic Complexity" and "Proposed Model for Regional Cultural Evolution," lay the groundwork for a subsequent set of topics, most of which are presented with associated hypotheses and additional questions. Questions concerning degrees of hunter-gatherer complexity are more interesting when they are placed in an explanatory context, which the proposed model is intended to create. In this context, the other research topics, including chronology, settlement/subsistence, technology, site formation processes, paleoenvironment, demography, ideology, culture history, exchange/external relations, gender and the organization of labor, ethnographic issues, and historical topics, take on added significance. Evidence for these topical areas is obtainable from a variety of site types, though care must be taken in estimating the research potential on the basis of classified site types. "Lithic scatters," which outwardly may look very similar but probably represent a wide variety of functions, can address a great many research topics. Sites with housepits have an even more robust capacity to answer research questions, because of the wide variety of data they possess, and their apparent position in the center of the settlement system. Among the historic sites, homesteads appear to have an analogous position in the settlement system, and may be the most valuable site type. Methods useful for addressing research topics are very numerous, and are expected to grow more numerous and complex with time. Examples of familiar archaeological methods include archaeological survey techniques, controlled surface collection, remote sensing, flotation retrieval of small organic debris, geomorphological examination of soil profiles, soil chemistry analysis, radiocarbon and obsidian hydration dating, tool edge wear and organic residues analysis, and faunal and floral analysis. Methods can also extend into outside subjects that may bear on important concerns, such as: research into the habits of animals, and factors governing populations of animals and plants; independent paleoclimatological studies; comprehensive use of ethnographic and ethnohistoric data; and archaeological experimentation. Archival research is particularly important in historical studies.

Based on the foregoing considerations, many management actions can be proposed. Among the most important are the following:

1. Improve cultural resource survey methods and data recordation.

2. Record data either missing from previously documented sites or suspected to be incorrect.

3. Include to a greater extent Native American tribal organizations and their concerns in land management processes.

4. Initiate a Programmatic Memorandum of Agreement with the State Historic Preservation Office and the Advisory Council on Historic Preservation.

5. Implement a Geographic Information System.

6. Develop a predictive model.

7. Gather additional information to expedite the evaluation process.

8. Instigate a program to document the wealth of existing, but largely untapped, data within the District's administrative area.

9. Develop and implement a plan to increase public awareness regarding cultural resources.

10. Implement measures to alleviate the loss of cultural resources.

11. Identify cultural resources eligible for special management designations.

12. Manage selected cultural resources deemed particularly interesting to the District in ways suitable for each resource.

The bibliography includes not only references cited, but also all substantial literature pertaining to the District.

ACKNOWLEDGEMENTS

The effort required to complete an overview such as this is substantial, and we are thankful for the assistance and support contributed by a number of individuals.

We would like to thank the BLM Prineville District for providing the opportunity to make this contribution to cultural resource management. Richard Hanes, in the BLM Oregon State Office (Portland), and Suzanne Crowley Thomas and Scott Goodman, in the Prineville District office, were all patient, very cooperative, and provided needed information and insight.

Several people within the IRI Eugene office were instrumental in the timely completion of this project. Pete Armitage worked on the tedious, but necessary, task of bibliographic compilation. Cassandra Hemphill assisted by typing tables and making editorial changes. All of the graphics in this report were done by Kevin McCornack. Debra Sandler contributed in the areas of bibliographic compilation and report production; Carolyn Waters entered data, made editorial changes, and helped produce the report.

Numerous people in museums, government agencies, universities, and at the Warm Springs Indian Reservation (all listed in Chapter 1, *Introduction*), provided assistance and background information during our reconnaissances of the Prineville District (and at other times), and demonstrated that a wealth of untapped information still exists. We are particularly grateful to Joseph Jones and the Camp Hancock staff, not only for the tour of archaeological sites in the Clarno Basin, but also for the hospitality during our visit. Pam Endzweig, currently analyzing data for her doctoral dissertation from Clarno Basin sites excavated by Camp Hancock crews, provided documents which probably would have been unobtainable otherwise.

This report is result of the efforts of all the people listed above; if we have overlooked anyone, we apologize

TABLE OF CONTENTS

page

ABSTRACT . . . iii
MANAGEMENT SUMMARY . . . iv
ACKNOWLEDGEMENTS . . . viii
LIST OF FIGURES . . . x
LIST OF TABLES . . . x

VOLUME I

Chapters

1. *INTRODUCTION* . . . 1
   - The Study . . . 2
   - Project Personnel . . . 3
   - Procedures . . . 5
   - Problems and Resolutions . . . 7
   - Preview . . . 7

2. *DATA RELIABILITY* . . . 9
   - Site Location . . . 9
   - Cultural Resource Condition . . . 11
   - Definitional Variability . . . 11
   - Reliability of Data Sources . . . 14
   - Probable Need for "Ground-Truthing" . . . 15
   - Biases in the Database . . . 16
   - Summary . . . 17

3. *SYNTHESIS AND INTERPRETATION OF CULTURAL RESOURCE DATA* . . . 19
   - Ethnography . . . 19
   - Prehistory . . . 51
   - History . . . 73

4. *ENVIRONMENTAL ASSOCIATIONS* . . . 79
   - The Environment and Human Land Use . . . 80
   - Distribution of Cultural Resource Sites . . . 87

5. *RESOURCE USE CATEGORIES* . . . 129
   - Discharged Use . . . 129
   - Scientific Use . . . 129
   - Management Use . . . 130
   - Public Use . . . 132
   - Socio-Cultural Use . . . 144
   - Conservation for Future Use . . . 146
   - Concluding Comments . . . 146

TABLE OF CONTENTS (Continued).

6. *SUGGESTIONS FOR FUTURE RESEARCH* 149
  Research Topics 150
  Site Types and Research Potentials 167
  Methods 169

7. *MANAGEMENT OPPORTUNITIES* 173
  The Arcsite Database 173
  Cultural Resource Inventories 177
  Previously Recorded Cultural Resource Sites 179
  Additional Data Needs 192
  Prioritized Actions 196

8. *BIBLIOGRAPHY* 201

LIST OF FIGURES

1.1. Location of the BLM Prineville District 3
1.2. General Map of the Cultural Resource Overview Study Area 4
3.1. Ethnographically Documented Winter Villages and Important Resource Areas of the Wayampam, Dalles Wasco, Dog River, and Watlala Tribes 36
4.1. Distribution of BLM-Administered Land within the Prineville District 89
4.2. Basins and Sub-basins within the Prineville District 93
4.3. Locations of Major Projects Addressing Human Land Use within the Prineville District 95
5.1. BLM Developed Recreation Areas and Wild And Scenic River Corridors Considered when making Provisional Assignments to the Public Use Category 133
5.2. State and Federal Highways Considered when making Provisional Assignments to the Public Use Category 140
5.3. Locations of Existing and Former Warm Springs Indian Reservation Boundaries 143

LIST OF TABLES

2.1. Locational Data Completeness for Prineville BLM ARCSITE Data Base File 10
2.2. Completeness of Arcsite Data Base Records for BLM Recorders Versus Non-BLM Recorders 12
3.1. Indigenous Languages of the North-Central Oregon Study Area 24

TABLE OF CONTENTS (Continued).

3.2. Food Fishes of North-Central Oregon 26
3.3. Food Plants of North-Central Oregon 28
3.4. Food Mammals of North-Central Oregon 34
3.5. Ethnographically-recorded Features of Twined Basketry Techniques 40
3.6. Key Reports on the Prehistory of the Prineville District 52
4.1. Frequency of Prehistoric and Historic Site Types in the Prineville District 92
4.2. Relative Frequency of Prehistoric and Historic Site Types by Basin 94
4.3. Relative Frequency of Prehistoric and Historic Site Types by Deschutes River Sub-basins 96
4.4. Relative Frequency of Prehistoric and Historic Site Types by John Day River Sub-basins 98
4.5. Relative Frequency of Prehistoric and Historic Site Types by 1000 Foot Elevation Intervals 101
4.6. Relative Frequency of Prehistoric and Historic Site Types by Plant Communities 102
4.7. Relative Frequency of Prehistoric and Historic Site Types by Primary Landform 104
4.8. Relative Frequency of Prehistoric and Historic Site Types by Secondary Landform 106
4.9. Relative Frequency of Prehistoric and Historic Site Types by Water Source 109
4.10. Mean Distance to Water by Prehistoric and Historic Site Type 110
4.11. Frequency of Prehistoric and Historic Site Types by Aspect and Sub-basin 112
4.12. Frequency of Prehistoric and Historic Site Types by Slope 113
4.13. Frequency of Sites with Shell and Sites with Ground Stone Tools by Sub-basin 114
4.14. Frequency of Sites with Ground Stone by Elevation Interval 115
4.15. Frequency of Pictographs and Petroglyphs by Sub-basin 116
5.1. Candidate Sites for Provisional Assignment to the Management Use Resource Category 132
5.2. Candidate Sites at or near BLM Recreational Facilities for Provisional Assignment to the Public Use Resource Category 134
5.3. Sites within Wild and Scenic River Corridors 135
5.4. Candidate Sites near State or Federal Highways for Provisional Assignment to the Public Use Resource Category 141
5.5. Candidate Sites for Provisional Assignment to the Socio-cultural Use Resource Category 145

TABLE OF CONTENTS (Continued).

5.6. Candidate Sites with Unique Characteristics for Provisional Assignment to the Future Use Resource Category 147
7.1. Individuals Knowledgeable About History and Prehistory in the Prineville District 195

VOLUME II

APPENDIX: PRINEVILLE DISTRICT'S ARCSITE DATABASE

1. INTRODUCTION

As part of its stewardship role for the public lands that it manages, the Bureau of Land Management (BLM) is required by a body of federal laws and regulations to inventory and oversee prehistoric and historic cultural resources on those lands. This responsibility is at once quite vital and very difficult, for cultural resources, in the form of prehistoric and historic sites and other traces of the human presence on the landscape, are very fragile, yet exist in large numbers and in many forms, often are hidden and difficult to find, and have importance that varies depending upon the criteria used and the opinions sought. Recognizing this degree of difficulty, the BLM has followed a policy, exemplified by this cultural resources overview, of seeking guidance for its management of cultural resources.

Such guidance was obtained by the BLM for its Prineville District in north-central Oregon from Toepel and Beckham (1978) and Toepel et al. (1980), who canvassed existing archives and documents to create a foundation of knowledge for agency use in its management activities. Knowledge of cultural resources in the area at that time was still relatively modest, and rather few investigations had provided large datasets, especially on BLM land. Since 1980, however, a veritable explosion of information has occurred, both on and off BLM land, rendering the previous overview outdated, and creating a need for a reconsideration of the state of knowledge in the context of the BLM management mandate. For, while information on cultural resources has grown at an unprecedented rate, digestion and synthesis of information by both the agency and the professional community has not kept pace. At the same time, pressure on (and thus the threat to) the resource base in the last decade, largely from increasing public use and land development, has intensified. For these reasons, the BLM retained INFOTEC Research, Inc. (IRI), to provide through this overview new guidance for agency management activities within the Prineville District in the 1990s.

The framework of this overview differs in important regards from overviews done previously for the Prineville District and other federal agency districts in the Pacific Northwest. Earlier overviews, as suggested above, have focused largely on summarizing information. As expressed by the Bureau of Land Management (1989a:24-25) in its specifications, however, this overview emphasizes management guidance:

> Update a Class I existing cultural resource data assessment that will provide the Bureau with additional guidance for the proper management of these cultural resource values through the 1990s. It shall include the following:
>
> (a) The range of variety, the apparent extent, and the probable importance of each of the various kinds of cultural resources presently known to exist within the study area, including how and by whom they may be considered important;
>
> (b) The quality and reliability of the existing database, including site distribution information, site specific information, and Indian tribal concerns;

(c) A regional context into which the existing information can be placed that utilizes the currently most relevant archaeological cultural history, processual reconstruction schemes, ethnographic information, and historical themes;

(d) The management options for resolving conflicts with other land uses;

(e) The needs for new cultural resource field survey and site testing/evaluation to improve the state of knowledge especially where there are substantial data gaps because previous work has been limited and/or biased; and,

(f) The management opportunities available to the agency for satisfying scientific, management, cultural and public use needs, and priorities for addressing them.

This description of project objectives clearly underscores an agency desire to find ways to enhance the effectiveness of its cultural resources management program. Gathering information is only part of the key toward achieving this goal; at least as important is the identification of management problems and the suggestion of ways to solve them.

In this enterprise we have an advantage in the presence of existing overviews (Toepel and Beckham 1978; Toepel et al. 1980), which already have described the physical environment of the Prineville District, summarized the state of knowledge on ethnography, prehistory and history as of about 1979, and prepared management recommendations. To the extent possible in this overview, we will avoid redundant coverage of facts presented there such as environmental, cultural, prehistoric, and historic background, and instead treat the earlier overview as a point of departure. By adopting this approach, we intend to devote our available time and resources to the principal purpose of this document, which is guidance for agency management programs.

THE STUDY AREA

The project specifications (Bureau of Land Management 1989a:25) define the area of coverage as "...the entire John Day and Deschutes river drainage basins." These two drainage basins, however, do not exactly match the boundaries of the Prineville District. The northeastern corner of the John Day River drainage, for example, is in the Vale District. Important parts of the Prineville District, including the northwestern and northeastern corners drained by streams flowing directly into the Columbia River in Hood River, Wasco and Gilliam counties, and the south-central margin in Deschutes and Lake counties, where the drainage systems are internal, are not within the Deschutes or John Day drainage basins. Operationally, then, and as a result of discussions with BLM personnel, the study area (figures 1.1 and 1.2) follows the boundaries of the Prineville District, with a necessary emphasis on the drainages of the Deschutes and John Day rivers, where the bulk of BLM land in the District is located.

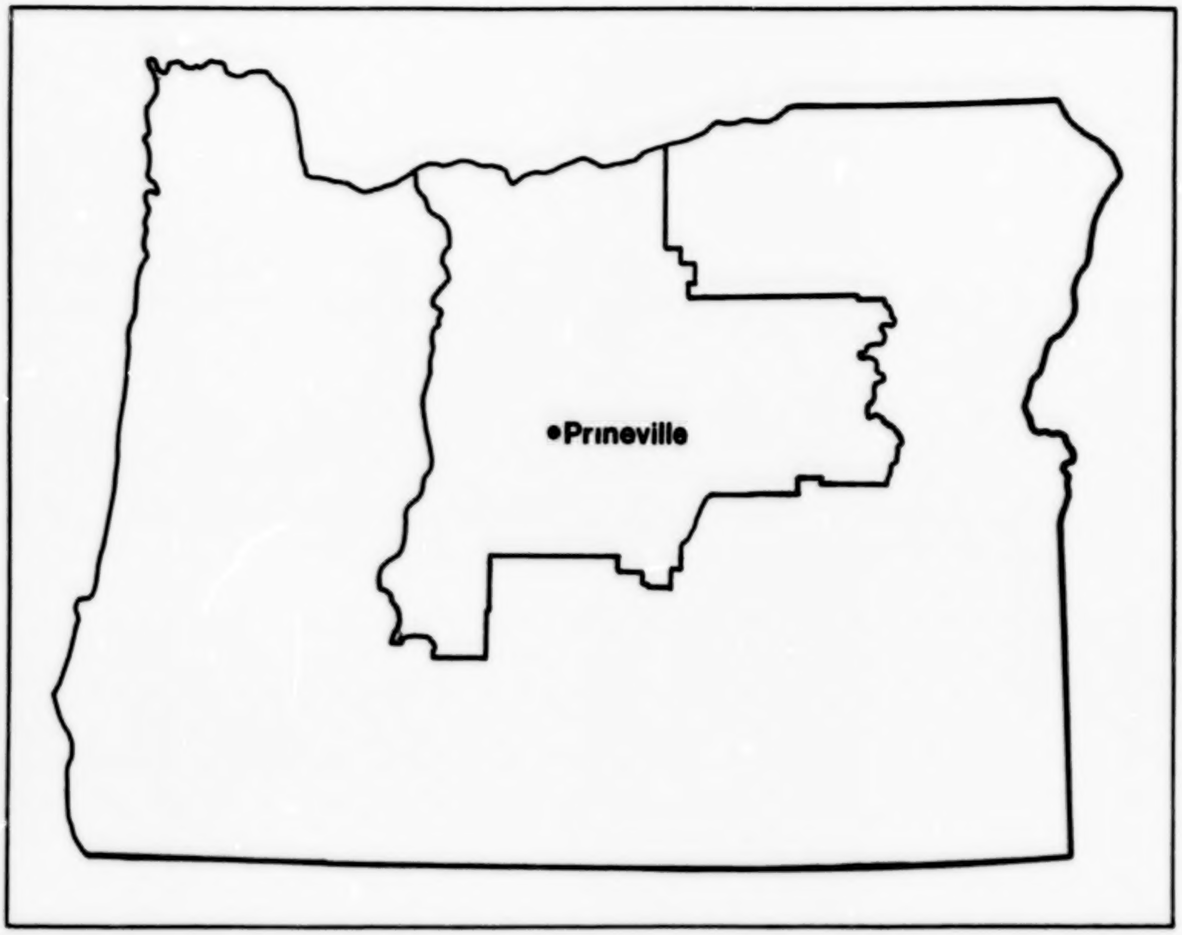


Figure 1.1. Location of the BLM Prineville District.

For the most part, the study area is considered irrespective of land ownership, since past cultural patterns have no necessary relevance to modern property boundaries. For certain purposes, however, information from BLM land only is used. Such is the case in Chapter 4, *Environmental Associations*, for the distributional study of sites recorded by the District, and for the management-related discussions of chapters 5 (*Resource Use Categories*) and 7 (*Management Opportunities*).

PROJECT PERSONNEL

The personnel who conducted the research and wrote this report each have had clearly specified roles in its creation. Overall supervisory responsibility was in the hands of Richard M. Pettigrew, Program Manager for the Pacific Northwest Branch of IRI. Pettigrew also was the major contributor to chapters 1 (*Introduction*), 4 (*Synthesis and Interpretation of Cultural Resource Data*), and 6 (*Suggestions for Future Research*), and participated in both project area reconnaissance tours (see below). Clayton G. Lebow, IRI Associate Program Manager, was

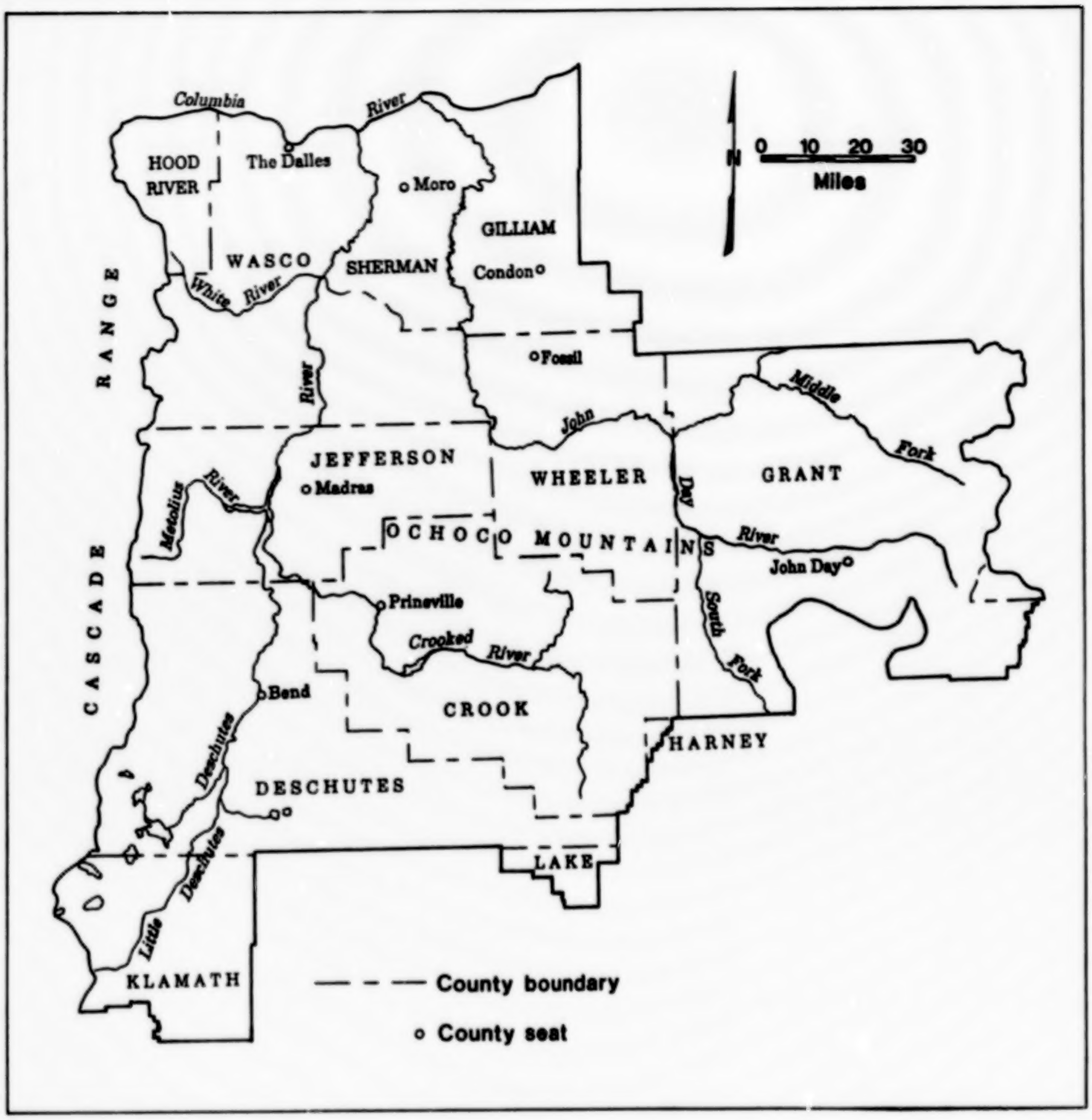


Figure 1.2. General Map of the Cultural Resource Overview Study Area.

the major contributor to chapters 3 (*Environmental Associations*) and 7 (*Management Opportunities*), interpreted the 903 Prineville District cultural resource site records and entered them onto a dBASE IV file, and participated in the second project area reconnaissance tour. Jon M. Silvermoon, IRI Staff Archaeologist, was the principal contributor to chapters 2 (*Data Reliability*), and 5 (*Resource Use Categories*). David H. Chance, of David and Jennifer Chance

& Associates, Moscow, Idaho, assumed the role of project historian. Chance participated in the first project reconnaissance tour and contributed those portions of this report concerning history and historical resources. The segments of this overview pertaining to ethnography and ethnohistory were contributed by Northwest Ethnohistorical Research Associates (NWERA), including Robert Boyd, Yvonne Hajda, and Henry Zenk, of Portland, Oregon. Robert Boyd wrote most of the sections on subsistence and settlement, transportation and economics, and religion and change; Yvonne Hajda was largely responsible for the sections on language, sociopolitical organization and life cycle ceremonies; and Henry Zenk supplied software expertise and information on linguistics and technology, especially basketry. All three members read, criticized and edited sections written by the others. Hajda was our principal contact with people on the Warm Springs Indian Reservation, where she has conducted ethnographic work for many years.

PROCEDURES

Work on this overview began with a meeting between IRI Program Manager Richard Pettigrew and BLM Prineville District Archaeologist Suzanne Crowley Thomas, during which were discussed the goals of the project, and the information resources available for its accomplishment.

Gathering information for the overview began in earnest with two reconnaissance tours of the Prineville District by project personnel. These tours were designed to develop additional familiarity with the area's cultural resources, to create a list of important information sources (including documents, archives, and knowledgeable persons), and to examine areas and sites of particular management concern. Richard Pettigrew and David Chance participated in the first reconnaissance tour during the period August 21-26, 1989. Institutions and their personnel contacted, and places visited, in the order in which they were visited during this tour, included the Deschutes National Forest, Bend (Jill Osborne); the High Desert Museum, Bend (Susan Harless); the Des Chutes Historical Center, Bend (Keith Clark); the Ochoco National Forest, Prineville (Paul Claeyssens); the Bowman Museum, Prineville (Irene Helms); BLM Prineville District, Prineville (Suzanne Crowley Thomas); Malheur National Forest, John Day (Norm Steggell); Oliver Historical Museum, Canyon City (Grace Williams); Kam Way Chung & Co. Museum, John Day (Carolyn Micnheimer); DeWitt Museum, Prairie City (Babs Brainerd); Fossil Museum, Fossil (Marilyn Garcia); the Wheeler County Courthouse, Fossil (staff); Oregon Museum of Science and Industry, Camp Hancock (Julie Howland); the Depot Museum, Condon (Chris Davis); Cottonwood Bridge, John Day River; the Macks Canyon Site, Deschutes River; the Monner Site, Deschutes River; the Sherman County Historical Museum, Moro (Julia and Mel Parker); the Fort Dalles Museum, The Dalles (Paula Kuttner); the Warm Springs Indian Reservation; and the Jefferson County Museum, Madras (Margaret Dement, Marjorie Maw, and Eleanor Watts). The first tour emphasized local historical sources that heretofore have been largely ignored, and resulted in the discovery of a large body of such data, much larger, in fact, than could be encompassed by this overview. Another result was a compilation of sites and localities worthy of inspection on the second reconnaissance tour.

The second tour, conducted during the period September 12-15, 1989, by Richard Pettigrew and Clayton Lebow, concentrated on examination of cultural properties considered important candidates for special management recommendations. These places, in the order visited, included Pictograph Cave (southeast of Bend), Glass Buttes, sites OR-05-560 and 562 on Big Summit Prairie, Camp Hancock (where we spoke with Joseph Jones, Managing Director, who showed us several sites investigated by Camp Hancock students), the Potlatch Canyon pictographs (involving a walk down into and back out of the John Day Canyon from the rim), Jones Canyon south of Arlington, Fourmile Canyon (Oregon Trail marker), and McDonald Crossing (Oregon Trail marker at a ford on the John Day River). This tour provided an opportunity to improve our first-hand knowledge of the contexts and conditions of some key cultural resources under BLM management.

Data entry of District site forms onto the ARCSITE computer (dBASE IV) file began after the second reconnaissance tour. Clayton Lebow examined all of the 903 site forms (in their various configurations) provided to IRI by the District, and interpreted and entered them in terms of the ARCSITE file structure and field definitions. As they were completed, the site forms relating to historic resources were provided to David Chance, who incorporated the information into his own analysis of patterning among historic sites. Processing of site forms took several months, before completion in December, 1989. The database created formed the basis for a variety of analyses and summaries of data used for this overview.

An important foundation for this document was a literature survey of ethnographic, historic, and archaeological reports, for the creation of a comprehensive bibliography, and for the preparation of chapters 3 (*Environmental Associations*), 4 (*Synthesis and Interpretation of Cultural Resource Data*) and 6 (*Suggestions for Future Research*). This task was simplified through use of the National Archaeological Data Base bibliography for Oregon (compiled by IRI from SHPO files in 1988). References from this bibliographic database were supplemented by the addition of documents (largely historical) discovered during the first reconnaissance tour to north-central Oregon repositories, and by visits to the Oregon State Museum of Anthropology (OSMA), the University of Oregon Library, and the SHPO. Furthermore, ethnographic documents were added to the list by NWERA (Robert Boyd, Yvonne Hajda, and Henry Zenk), and additional historic documents were provided by David Chance, who also made a special tour of western Oregon repositories (including the Oregon Historical Society, the Oregon State Archives, and the University of Oregon Library) for this purpose in December, 1989.

To make adequate provision for the important and unique ethnic concerns of the people of the Warm Springs Indian Reservation, whose ancestors were the principal aboriginal users of the project area, IRI arranged for an ethnologist (Yvonne Hajda) to interview persons on the reservation, and to refer to already compiled notes from earlier years of work there, regarding aboriginal, historic, and current uses of the project area. Dr. Hajda placed particular emphasis on identifying sites and site types in relation to geographic variables. This contact was desired to allow the Warm Springs people to have a substantial contribution to the overview and to make known whatever concerns they have regarding BLM management practices in the years to come. Dr. Hajda contacted Dan Mattson, Warm Springs Archaeologist, as well as tribal staff members Delbert Frank, Eugene Green, Madeline McInturff, Jeannie Thomas, and Mary Tohet. Information concerning former and current land use practices was derived from notes recorded by Edward Harper from Northern Paiute informants in the 1950s, notes recorded by David and Kathrine French from 11 Wasco and 5 Warm Springs Sahaptin people, and her own notes from interviews with two Wascos, five Sahaptins, three Northern Paiutes, and two others of mixed ancestry. Anthropologists contacted by Boyd, Hajda and Zenk included David and Kathrine French and Theodore Stern.

Other procedures followed in the creation of the overview are described within the various chapters that follow.

PROBLEMS AND RESOLUTIONS

Rather few remarkable problems occurred during preparation of this overview. One that should be mentioned relates to the availability of data from the USDA Forest Service, which manages vast tracts of land within the overview study area. Clearly, analysis of large amounts of data requires the use of automated techniques. The Deschutes National Forest in about 500 separate surveys has recorded about 1000 archaeological sites but no computerized database has been created. The Ochoco National Forest has recorded just over 2000 sites, and plans to have its sites on an automated database by some time in 1990. The Malheur National Forest maintains a computer database for its 4000 recorded archaeological sites and isolates. Encouraged by this circumstance, IRI arranged to obtain a copy of the database files in the hopes of carrying out analyses of cultural resource patterning in the upper John Day River drainage. Unfortunately, technical problems prevented successful conversion of the data into a form readable by dBASE IV, and thus we were not able to use these files. Given more time and resources, this technical problem might be resolved, but for the present we are unable to use the large body of Forest Service site data in our analyses of site distributions (beyond, of course, examination of summaries and overviews done by others).

PREVIEW

This report consists of two volumes. Volume I contains the data presentation, analyses, and discussion, as well as the management recommendations and bibliography. Volume II includes the Appendix, comprising printed versions of the 903 site records on file in the Prineville District.

Chapter 1 is this *Introduction*, describing the reasons and goals for the study, definition of the study area, personnel involved in the project and their roles, procedures for data collection and manipulation, and problems encountered during the study.

Chapter 2, *Data Reliability*, assesses the quality of the available data, based on an examination of the site records encoded into an automated database file. In this chapter, reliability is examined in terms of a number of attributes, including site location, cultural resource condition, variability in site definition, reliability of data sources, probable need for "ground-truthing," and biases in the database.

Chapter 3, *Synthesis and Interpretation of Cultural Resource Data*, brings together the currently available and relevant reports on previous investigations in the study area to describe the course and patterns of human culture over the entire prehistoric and historic period. This presentation necessarily is somewhat speculative, based as it is on a very incomplete and biased body of data. These data limitations are highlighted, to be brought up again in Chapter 6.

Chapter 4, *Environmental Associations*, briefly discusses the past and present environmental parameters of the study area in terms of their relevance for human adaptation. Next comes an examination of the environmental associations of archaeological sites across the landscape within the study area, based on the automated database and information already present in the published and unpublished literature. The results of those analyses then are combined into a discussion of distributional tendencies.

Chapter 5, *Resource Use Categories*, examines the sites recorded for the District in terms of their appropriateness for assignment to one or more of the six BLM-defined resource use categories. The presentation is organized by consideration of each category in turn.

Chapter 6, *Suggestions for Future Research*, considers the data limitations revealed by the previous chapters, as well as the cultural patterns suggested by the existing data, to generate a comprehensive set of research questions and associated hypotheses applicable to the cultural resources present on BLM-administered lands. An important focus is the identification of the kinds of sites and potential analyses that can address the relevant research issues.

Chapter 7, *Management Opportunities*, is the culmination and end result of the preceding discussions, since the purpose of the overview is to provide cultural resource management guidance for the District. Major areas for recommendations include the automated database for site records, the subject of cultural resource inventories, management of previously recorded sites, and additional data needs. The chapter concludes with a prioritized list of recommended administrative actions.

The final section of this volume is the *Bibliography*, which includes much more than the sources cited in the text. Over and above citations, the bibliography contains a comprehensive list of references dealing with the ethnography, prehistory, and history of north-central Oregon, with the exception of minor archaeological inventory reports. This list is considered an important resource for investigations yet to be undertaken.

2. *DATA RELIABILITY*

The following discussion involves an assessment of the quality of the cultural resource data in the BLM Prineville District's site records. This assessment is based on an examination of the BLM's site records as encoded by INFOTEC Research, Inc., into a dBASE IV file (ARCSITE), and also on a review of major survey reports including Mack (1975), Polk (1976), Hibbs et al. (1976), and Lyman et al. (1983). In accordance with contract specifications, particular attention was paid to the accuracy of site locations, the adequacy of documentation of cultural resource conditions, definitional variability in the terms used, the reliability of various sources of data, the probable need for "ground-truthing," and biases in the current database resulting from the research questions or management needs for which the data were originally generated.

SITE LOCATION

The only sure way to determine whether or not site locational data are accurate is to use the data to visit each and every one of the 903 sites in the ARCSITE database file. However, practical and contractual limitations to this study preclude such an in-field check. In the absence of field inspection, an indication of the accuracy of this information can be obtained by examining the site records for the completeness of the locational data. Where locational data are missing or incomplete, locating a site will become more difficult. Further, the more incomplete the data, the more possible it is that the data may be inaccurate.

Two sets of locational data were examined for the 903 sites in the ARCSITE database files. A "minimal locational data set" was defined as the presence of all legal locational information including quarter-quarter Section, quarter Section, Section, Range, and Township as well as identification of USGS quadrangle and UTM designations. A data record of site location for an individual site was considered minimally complete if it contained information in each of these fields. A "full locational data set" was defined as the presence of all minimal data as well as elevation, drainage, basin, subbasin, primary and secondary landforms, and primary and secondary positions on those landforms.

Of the 903 records in the ARCSITE database file, 584 (64.7 percent) had complete minimal locational data sets, and only 131 (14.5 percent) had complete full locational data sets (Table 2.1). Viewed over time, sites recorded prior to 1976 are mostly lacking in locational data; only 8 of 123 sites recorded had even minimal locational data. Sites recorded in 1976 and 1977 generally had good locational data. Since 1980 over three-quarters of the sites recorded (397 of 520 sites) have complete minimal locational data. Yearly variability has ranged from 17.4 percent in 1985 to 100 percent in 1984, 1986, and 1988. For full locational data, except for sites recorded in 1976 and 1977, complete full locational data sets are not present in nearly all site records. The percentage of site records with full locational data begins to rise in 1987, rising from 11.1 percent that year to 35.4 percent in 1988 and 47.6 percent in 1989. The apparent anomaly of the improved locational data for site records

Table 2.1. Locational Data Completeness for Prineville BLM ARCSITE Data Base File.

Site Recorded (Year)	Site Records (Count)	Records with All Legals, UTM, and Quad Recorded		Records with Full Locational Data* Recorded	
		Count	Percent	Number	Percent
1962	2	0	0.0	0	0.0
1964	4	0	0.0	0	0.0
1965	1	0	0.0	0	0.0
1968	9	1	11.1	0	0.0
1969	2	0	0.0	0	0.0
1970	3	0	0.0	0	0.0
1972	1	0	0.0	0	0.0
1973	1	0	0.0	0	0.0
1975	100	5	5.0	5	5.0
1976	233	177	76.0	65	27.9
1977	2	2	100.0	2	100.0
1978	13	0	0.0	0	0.0
1979	9	1	11.1	0	0.0
1980	23	19	82.6	1	4.3
1981	81	73	90.1	8	9.9
1982	65	13	20.0	2	3.1
1983	39	35	89.7	0	0.0
1984	92	92	100.0	1	1.1
1985	63	11	17.4	0	0.0
1986	14	14	100.0	0	0.0
1987	36	35	97.2	4	11.1
1988	65	65	100.0	23	35.4
1989	42	40	95.2	20	47.6
TOTAL	903	584	64.7	131	14.5

* Full locational information includes all legals, UTM, USGS quadrangle, elevation, drainage, basin, subbasin, primary and secondary landforms, and landform positions.

from 1976 can be attributed to two major surveys conducted, along the John Day River (Polk 1976) and the Deschutes River (Hibbs et al. 1976) respectively.

Working with the locational data for sites in order to designate sites to resource use designations (Chapter 5, *Resource Use Categories*) revealed that, in some cases even if the site records had a full locational data set, the data were not always accurate. For example, the ARCSITE database file indicates that site EA-13 is in Township 2S., Range 16E., Section 6; Hibbs et al. (1976:Map 19) indicate that it is in sections 19 and 24. The ARCSITE database file also places site NA-13 in Township 2S., Range 14E., Section 13, while Hibbs et al. (1976:Map 19) put it in Range 15E. Other errors such as this possibly are present in the database or in the reports.

CULTURAL RESOURCE CONDITION

Data pertaining to the condition of cultural resources are largely lacking in the ARCSITE database file. Of the 903 site records, only 216 (23.9 percent) have any value assigned to **Integrity** (Table 2.2). Of all the fields in the database, only two contain information concerning the condition of sites: **Integrity** and **Location**. The latter field contains data from which condition could be inferred (e.g., a site located in an unimproved parking lot or at a developed boat ramp). In many cases, especially for sites recorded by the Deschutes River survey (Hibbs et al. 1976) or the John Day River survey (Polk 1976), integrity data were not present in the site records but were present in the text of the reports.

Another factor to consider is that the integrity data for many sites are more than ten years old, and conditions at the sites may have changed, particularly for riverine sites reportedly subject to erosional activity. This includes the 100 sites recorded before 1980 for which integrity data are available.

Further, the ARCSITE database file makes no distinction between surface and subsurface integrity. Because only 3 sites of the 903 in the database have been tested, one could assume that integrity data which are reported generally represent assessments based on surface evidence. However, such data may be misleading to persons deciding the resource use designations for sites, since, while a site may lack 100 percent of its surface integrity, substantial and significant subsurface cultural deposits may be present. Thus, on the face of it, while a site with zero integrity recorded in the database may appear to be a prime candidate for designation to the discharged use category, such a designation could result in the loss of significant and important scientific information if the site has undisturbed subsurface deposits.

DEFINITIONAL VARIABILITY

Recorders of sites varied in the Prineville District in their minimal criteria for site designation. Current BLM criteria in the Prineville District define a prehistoric site as a location where more than ten artifacts are found in an area 10 by 10 m (Silvermoon 1989:5). This can be expressed also as a minimum artifact density of one artifact per ten square m (1/10 m^2).

Eighty-eight sites in the ARCSITE database file were recorded as part of a survey in the Glass Buttes Area. Mack (1975:5) reported that the large quantity of naturally broken obsidian in this area affected their site definition, which depended on the "discovery of well-formed artifacts rather than on the discovery of used or worked flakes." By implication, then, sites recorded by this survey did not include artifact concentrations without "well-formed" artifacts. Thus, a concentration of flakes exceeding current BLM site criteria might not have been recorded as a site. In addition, Mack (1975:40) limited isolated finds to those locations with single "tool" artifacts. Mack's report is unclear as to how flake concentrations without "well-formed" or "tool" artifacts were handled.

Table 2.2. Completeness of ARCSITE Data Base Records for BLM Recorders Versus Non-BLM Recorders.

Recorder Name	Site Records (Ct.)	Minimal Location		Full Location		Slope		Plant, soil, and water		Area		Integrity	
		Ct.	%	Ct.	%	Ct.	%	Ct.	%	Ct.	%	Ct.	%
Pre-1980:													
Mack 1975	88	0	0.0	0	0.0	5	5.7	38	43.2	88	100.0	2	2.3
Polk 1976	82	68	82.9	64	78.0	0	0.0	63	76.8	74	90.2	18	20.7
Hibbs 1976	146	109	74.7	1	0.7	10	6.8	118	80.8	135	92.5	69	47.3
All Pre-1980	383	187	48.8	72	19.0	16	4.2	236	61.6	348	90.8	100	26.1
1980+:													
Non-BLM 1980+	69	56	81.2	5	7.0	17	24.6	31	44.9	69	100.0	10	14.5
BLM	423	334	80.4	59	13.9	103	24.3	352	83.2	411	97.2	104	24.6
All 1980+	520	397	76.3	59	11.3	121	23.3	400	76.9	506	97.3	116	22.3
ALL RECORDS	903	584	64.7	131	14.5	137	15.2	636	70.4	854	94.6	216	23.9

Notes:

1) BLM recorders are all from 1980 to present and include Linda Clark, Suzanne Crowley Thomas, Pam Endzweig, Andrew Goheen, Dennis Griffin, Judy Knokey, Dan Mattson, Steve Matz, Robert Pastor, David Sadow, Debi Soper, Marci Todd-Enneberg, Scott Thomas, and Ron Towner.

2) Non BLM-Recorders for records from 1980 to present include Thomas Churchill, Carl Davis, Debra Sandler, Julia Follansbee, R. Lee Lyman, Sara Scott, and Jon Silvermoon.

3) Some recorders for the period 1980 to present were not identified as to whether or not they were BLM employees. These tended to be recorders with only one or two sites recorded. Thus, the total for non-BLM and BLM employees since 1980 will not add up to the total for all records since 1980.

Eighty-two sites in the ARCSITE database file were recorded during a survey of the John Day River Canyon. Polk (1976:23) reported that "isolated cultural features and artifacts" were not recorded as sites and that, although "isolated artifacts were seldom encountered, features such as talus pits and rock piles were found." No specific site criteria are given in Polk's report. However, prehistoric site types are discussed under two broad categories: limited activity areas and habitation sites. Limited activity areas included rock features (talus pits, rock pile, and rock alignments), rock art sites, lithic resource exploitation sites, and biotic exploitation sites. Habitation sites included housepit sites, rockshelters, and other open sites. Polk (1976:56, 65) also grouped historic sites into the same two broad catagories, with limited activity sites including roads, trails, ferry crossings, agricultural fields and canals, graves, and stills; and habitation sites primarily including homesteads.

One hundred and forty-six sites in the ARCSITE database file were recorded during a survey of the Lower Deschutes River. Hibbs et al. (1976:3) used four alternative criteria for identifying a site including

> (1) the presence of man-made or utilized implements and/or the manufacture of implements, collectively referred to as artifacts,
>
> (2) the presence of concentrations of disarticulated faunal remains persisting over a definable surface area,
>
> (3) the presence of one or more man-made features or structures, and/or the presence of surface features not otherwise explainable as a result of natural causes, and
>
> (4) the presence of local soils at variance in composition to native soils of adjacent areas and displaying one or more artifacts or faunal remains.

No minimal number of artifacts is identified clearly as a criterion for defining a site. The first of Hibbs' four criteria listed above would seem to imply that two or more artifacts were needed to identify a site. However, the last of his criteria specifically refers to one artifact in a location along with some type of soil anomaly.

Nineteen sites in the ARCSITE database file were recorded during a survey of the Redmond Training Area. Lyman et al. (1983:83-84) "operationally defined" a site as a concentration of "artifacts too dense to collect and map using reconnaissance procedures." No specific number or density of artifacts was identified as a minimal threshold for defining a site. Areas with cultural material but not defined as sites were called "archaeologically sensitive areas" (Lyman et al. 1983:274). An examination of the site maps and descriptions in Lyman's report shows that, for sites for which data is given, 2 of 14 have mean artifact densities of less than 1/10 m^2, the current Prineville District criterion. These two "sites" had densities of 0.9/10 m^2 and 0.3/10 m^2. Maximum artifact densities for the 14 sites ranged from 25/10 m^2 to 160/10 m^2.

As can be seen from the foregoing discussion, considerable variability has existed in the definition of prehistoric sites. A similar situation appears to exist for historic sites. However, for historic sites an overall set of District criteria currently does not exist.

Another ambiguous area concerns assignment of sites, no matter how defined, to site types. Because the current ARCSITE database file will accept only one unique designation of site type for each site, and because no standardized definitions exist for site types, a large potential for bias applies when a recorder assigns a complex site to a particular type. For instance, a site with rock art might be typed as an "open site," "midden," or "shelter/cave" in addition to a "rock art" site, depending on both the quantity and diversity of other cultural material which might be present. A similar situation is true for historic sites with artifacts and architectural or engineering structures of varying integrity.

Furthermore, the historic site types available in the ARCSITE database file (Bureau of Land Management 1989b) appear to be overly restrictive, and can result in assignments which do not describe the sites adequately. One of the authors (Chance) classified the Prineville District historic sites into a descriptive site typology resulting in 20 different types, including homesteads, cabins and shacks, dumps and trash piles, sites associated with railroads, camps, graves, alcohol stills, schoolhouses, townsites, mining sites, mining ditches, irrigation canals, cable ferries, rock structures, corrals, blazed trees, drift fences, hunting platforms, roads, and wagons. An expanded site typology along these lines would better reflect the actual types of historic sites that exist.

A pair of terms frequently used by recorders without definitions are "artifact" and "tool." As the discussion above regarding Glass Buttes (Mack 1975) indicates, distinctions sometimes are made between "well formed artifacts," "used or worked flakes," and "tools." Further, an examination of the ARCSITE database file shows a variety of both descriptive and functional terms used to described cultural material. For instance, some recorders use descriptive terms such as "biface" or "uniface" while others use functional terms such as "knife" or "scraper." For comparability between site records, data recording methods should be consistent.

Other unclear terms used include "integrity" and "slope." As the previous discussion indicated, the term "integrity" appears to have been applied primarily to the surface evidence of sites. However, no clear direction on the use of the term could be found in any of the reports, site records, or BLM contracts examined. As for the term "slope," the relative lack of such information in the database suggests some ambiguity among recorders as to the meaning or importance of the category. Specifically, on some site forms slope was recorded in terms of degrees while on others in terms of percent. In some cases the differences between these two types of measurements probably were not clearly understood by site recorders.

RELIABILITY OF DATA SOURCES

We assessed the reliability of data sources by examining three aspects of the ARCSITE database file: differences in the record over time, differences between site records made by BLM employees and non-BLM employees, and a comparison of site records with major survey reports. As Table 2.2 indicates, site records do not necessarily become more complete in more recent years, a somewhat surprising finding. While complete minimal locational data sets increased from about half of the pre-1980 site records to a little more than three-quarters of the post-1980 site records, complete full locational data sets decreased from 19.0 percent to about 11.3 percent. Assessment of site integrity also decreased from 26.1 percent in pre-1980 records to 22.3 percent for post-1980 site records. On the other hand, improvements were made in the frequency of slope data (4.2 percent to 23.3 percent) as well as environmental data concerning plant communities, soils, water type, and distance to water (61.6 percent in pre-1980 records to 76.9 percent in post-1980 records). Generally, assessment of size was made by nearly all recorders, with improvement from 90.8 percent in the pre-1980 records to 97.3 percent in the post-1980 records. Overall, though, one cannot assess the reliability of site data from the date of the site records alone.

In comparing site records made by BLM and non-BLM employees, few significant differences were found. Since nearly all sites recorded by BLM employees were done during or after 1980, for a more accurate comparison only those non-BLM records from the same period were used. In making these comparisons we encountered a problem with identifying site recorders: several site recorders entered their names on forms in more than one manner. Frequently an individual might be listed, for example, as "J. Jones," " James Jones," "Jim Jones," or "Jones." Another variation arose when, apparently, an individual's name changed due to marriage, for example,"Mary Johnson" to "Mary Johnson-Smith" or "Mary Smith." These differences in names made it difficult to track recorders through the database.

For minimal locational data, slope, and area the differences between BLM and non-BLM employees is only 2 or 3 percent, with the latter somewhat more consistent in recording this type of data. BLM employees recorded complete full locational data slightly more frequently than non-BLM employees (13.9 percent to 7.0 percent). More significant differences were found with integrity and environmental data. BLM employees recorded integrity 24.6 percent of the time compared to only 14.5 percent for non-BLM employees. The widest differences were found with plant community, soil, water type, and distance to water: BLM employees recorded data in all four of these fields 83.2 percent of the time, but non-BLM employees did so only 44.9 percent of the time. This could be a consequence of greater familiarity with local environmental conditions, plant associations, and soil types by BLM employees consistently working in an area, as compared with a contractor or university researcher without such experience.

In comparing the ARCSITE database file records to major survey reports we found that, in many cases, information contained within the text of the report was not found in the site database. This was particularly true for sites reported on the John Day survey (Polk 1976) and the Deschutes River survey (Hibbs et al. 1976). The data most frequently found in the reports but not in the database pertain to site conditions in general and integrity in particular.

In addition, while comparing the ARCSITE database file records to partially or fully completed National Register nomination forms on file with the BLM, we found that no site record for most of these potentially eligible resources existed in the database, probably because no site forms exist for these sites or districts. These resources include the Fourmile Segment of the Oregon Trail, the McDonald Crossing of the John Day River (a part of the Oregon Trail), a 12-mile segment of the Meek Cutoff, the Willamette Valley and Cascade Mountain Military Wagon Road, Sherar's Bridge and Falls, and the Oregon Trunk Railroad stationmaster's quarters in Maupin. These sites are discussed further in Chapter 5, *Resource Use Categories* and Chapter 7, *Management Opportunities*.

PROBABLE NEED FOR "GROUND-TRUTHING"

For sites recorded prior to 1980, an in-field check of site location would seem to be warranted given the relative lack of locational data in the site record database for sites recorded during that time. Environmental data for sites recorded during this period as well as for sites recorded by non-BLM personnel at later times, also would require checking. If decisions are based on current Prineville District site definition criteria, then all sites recorded before the current set of criteria were established need to be checked as well as isolates and other archaeological phenomena recorded or noted in field records. Further, since integrity data decrease in reliability over time due to changing site conditions, these data also need to be rechecked prior to making decisions concerning site disposition.

BIASES IN THE DATABASE

The current ARCSITE database file cannot be considered representative of the universe of archaeological or historic cultural resources on the BLM Prineville District. Nearly all survey work has been "compliance-driven" and focused on locations where ground-disturbing activity was expected to occur. This would mean, then, that a bias towards areas with plant communities suitable for timber production or grazing-related facilities probably exists in the database. Further, another bias apparent is towards areas along major rivers, such as the John Day and Deschutes, used for recreational purposes. Relatively absent from the database would be areas representative of low-productivity plant communities or low water availability.

Another source of bias in the site records relates to survey design. For instance, the Lower Deschutes River survey was biased to the extent that, due to time constraints, greater emphasis was placed on cultural resources most likely to be "endangered from vandalism," "unregulated public use," or "construction of public facilities" (Hibbs et al. 1976:2). The Glass Buttes inventory involved a survey of "areas considered most likely to contain cultural resources" with an emphasis on the relationship of sites to environmental features such as playa margins, ridge tops, areas adjacent to intermittent streams, rills, or springs, and cliff faces (Mack 1975:3-4). On the other hand, more recent work has tended to involve 100 percent coverage of survey areas regardless of environmental variability (Gibson 1989; Silvermoon 1989). This more recent work tends to eliminate biases relating to preconceived notions of prehistoric site locational variables derived from a non-random database. However, it will not necessarily eliminate biases which may be the result of differing ground visibility in survey areas, nor does it reduce the biases inherent on the location of "compliance-driven" surveys.

Other sources of biases in the database relate to the discussion above concerning definitional variability in terms such as "site." What is recorded by a survey such as that in the John Day River Canyon, where the primary purpose of the survey involved "future management and protection" (Polk 1976:iii), would differ from that recorded by a survey concerned with an archaeological record perceived "as a more or less continuous distribution of artifacts scattered over the landscape differing in density" (Lyman et al. 1983:83). In the former case large or more complex sites near threatened areas might be emphasized, while in the latter case any and all cultural material might be recorded or noted.

Another source of bias in the database can be attributed to changes in archaeological research orientations over time. During the earlier years of site recording, a greater focus was placed on the need to "salvage" or protect sites threatened by destruction, the desire to establish the antiquity of human occupation in Oregon, and a perceived ability to delineate culture areas or to identify ethnicity in the archaeological record. Thus, small, isolated, homogenous lithic scatters tended to be perceived as of less importance than large, complex sites with features and heterogenous artifact collections. More recent years have seen a shift to more processual issues concerned with settlement and subsistence systems, human-environmental relationships, and social-economic-technological change. This shift has increased the relative importance of small lithic scatters which may have been overlooked or examined with less intensity and thoroughness than previously. It also has focused more attention on environmental locations other than those in proximity to rivers and other water sources.

SUMMARY

In general the quality of data in the ARCSITE database files shows improvement over time with records tending to be somewhat more complete the more recently a site has been recorded. Information on site location and integrity often are missing from the records, and usually distinctions between surface and subsurface integrity are not made. Sites are defined differently for different projects, and the assignment of sites to site types is plagued by definitional ambiguity and inflexibility. Important descriptive terms often are used inconsistently. Some variability in the quality of the data is seen by comparison of BLM with non-BLM recorders, and of site records with survey reports. Particularly for sites recorded before 1980, ground-truthing appears to be necessary. Finally, the data appear to be biased by variable survey purposes and designs, and reflect changes in research orientations over time.

BLANK PAGE

3. SYNTHESIS AND INTERPRETATION OF CULTURAL RESOURCE DATA

Management of cultural resources in the Prineville District depends fundamentally on our store of knowledge about how human beings have lived in the region from earliest times to the present. This knowledge ultimately measures the perceived importance of the remaining traces of the human past. A volume much larger than this one would be needed to completely describe the extent of current historic and prehistoric knowledge, but a shorter summary of the topic, such as presented in this chapter, should serve to provide needed background for the analyses and presentations that follow. The subject for our purposes is divided in three parts. First is coverage of ethnographic lifeways, describing the aboriginal cultures as recorded at the time of first Euro-American contact, and providing some basis for the subsequent delineation of the prehistoric record from earliest times to the contact period. Finally, and as a continuation of the chronological sequence of human cultures, the historic period is depicted. Throughout the entire set of discussions, a major theme is that of cultural processes and patterns, particularly as related to land use and ecological adaptation.

ETHNOGRAPHY

A fundamental problem in most ethnographic research is defining the basic unit of study. This problem is particularly acute on the west coast of North America, where politically distinct "tribes" were rare, where culture trait distributions did not coincide, and where linguistic "boundaries" were obscured by extensive intermarriage, co-occupation, bilingualism, and seasonal movement.

North-central Oregon is a prime example. Within the drainages of the John Day, Deschutes, and Hood rivers, the area covered in this report, outsiders have at different times noted several Indian "tribes" of variable definition and level of inclusiveness. A partial list (geographically, roughly clockwise) includes John Day, Lohim, Sapa, Pishquitpah, Umatilla, Wahhowpum, Snake, Hunupui Eaters, Shoshone, Paiute, Northern Paiute, Juniper-Deer Eaters, Warm Springs, Tygh, Tilhoney, Molalas, Shahala, Chilluckkitequaw, Dog River, Wapamthla, Cathlasco, Wasco, Upper Chinook, Echeloot, Enechuh, Tenino, Celilo, Wyam, Wanapum, Sahaptin, and Walla Walla.

In an attempt to cut through this historical confusion, ethnographers traditionally have tried to classify local groups into larger, more manageable units on the basis of cultural similarities (by compiling and comparing "culture element lists") and linguistically. Both these methods, as we will see, have many problems, not the least of which is a tendency to reification of the units so defined. There are other ways of defining meaningful units. Subsistence orientation is one. Salmon were a staple resource among the Chinookans; roots were as or more important among Sahaptins; and Molalas were known as hunters. In the southern portion of the study area, Indians themselves refer to the inhabitants of a particular region by the name of a distinctive local food ("food-named groups") (Fowler and Liljeblad 1986:436). Throughout most of the remaining area, winter villages, with associated proximate resource areas, are the most stable units (Ray 1939:4; for the adjacent Northwest

Coast see Mitchell 1983). And, in this part of North America, broader groupings have been defined operationally (as opposed to the static categorization of culture areas) by examining social ties among groups, identifying the networks that result from these ties, and defining larger, interactive social regions (e.g., Hajda 1984).

In this overview, we will eschew traditional "tribal" classifications. Culture element and linguistic groupings will be taken as givens, but recognized for their drawbacks. We will attempt to direct our discussion to those units and groupings which were more meaningful to the Indians themselves, and which should be more useful to archaeologists. We will be looking in particular at subsistence rounds, settlement patterns, and social ties as they may be manifested in material remains.

METHODS AND PROBLEMS

What follows is not an ethnography in the strict sense of the word, though it observes (roughly) the organizational format established by standard regional ethnographic works (e.g., Fowler and Liljeblad 1986; Murdock 1980; Spier and Sapir 1930). Instead, this overview is problem oriented--most properly an ethnographic overview for a particular audience (archaeologists and cultural resource managers).

The overview summarizes relevant information from three broad data sources. First are the traditional ethnographic works listed above: Spier and Sapir's "Wishram Ethnography" (1930), supplemented by Curtis' "Chinookan Tribes" (1911) for Wasco-Wishram speakers, Murdock's "Tenino Ethnography" (1980) for Columbia Sahaptin peoples, and Fowler and Liljeblad's "Northern Paiute" (1986). The latter two monographs were written for the Smithsonian Handbook of North American Indians; we have also consulted draft versions of David French's chapter on Wasco-Wishram and Theodore Stern's chapter on Umatilla-Cayuse-Walla Walla. A second important data source, used in this report for all sections on technology, comprises the two volumes of culture element distribution studies which cover the Plateau (Ray 1942) and Northern Paiute (Stewart 1941). The third category is broad, and includes a number of recent problem-oriented studies. Notable are the following:

(1) A series of works dealing with regional cultural ecology. The most comprehensive of these is Hunn's (1990) Nch'i Wana ("the Big River") (also consulted in manuscript).

(2) A small body of papers emphasizing network analysis (Anastasio 1972 is the best-known from this list).

(3) A diverse group of items that work from an ethnohistorical database (French 1961 and Spier 1935 are two examples).

(4) Manuscript field notes from Warm Springs (e.g., French and French 1951-55; Harper 1951-53) and documents connected with fishing rights cases (e.g., Seufert Brothers Company 1916; Swindell 1942).

Each of these sources has its limitations. The traditional ethnographic works and element lists uniformly utilize data collected from only a few informants, not a broad sample, and therefore may be biased to a particular region and subject to factual error. In addition, all informants consulted by ethnographers were born well after the early 1800s, and had therefore never known at first hand truly "aboriginal" culture. Both the traditional ethnographies and element lists owed much to the Boasian particularistic school, and hence tend to be monochromatic and static, without much information on systemic relations or patterns of culture change. The more recent specialized studies compensate for some of these problems: the cultural-ecological approach brings in information from natural history and studies how it interrelates with Indian culture; network analysis moves away from the interactions of these units; ethnohistory provides a temporal framework for the particularistic emphasis on units per se and concentrates instead on data gleaned from informants, and examines processes of culture change resulting from Euroamerican contact.

Much of the data summarized in this overview was collected by the methods and affected by the biases of Boasian particularism; our task, when possible, has been to present and reinterpret this data in the framework of the three approaches listed above. What we have done here is only a beginning.

CULTURE AREAS

The northern two-thirds of the north-central Oregon study area falls within the "Plateau Culture Area"; the southern third is a part of the "Great Basin Culture Area." In its entirety, the Plateau Culture Area includes (roughly) the interior drainages of the Fraser and Columbia rivers (excluding the upper reaches of the Snake, John Day and Deschutes). The Great Basin Culture Area encompasses all of the Great Basin, plus peripheral regions such as the aforementioned southern tributaries of the Columbia, and much of the upper Colorado River drainage.

The distinctiveness of these two "culture areas" has been recognized since the first attempts at classification were made by Mason in the late 1800s (1896:650). Mason drew the Plateau/Basin line on the basis of language distributions ("Sahaptian" and "Shoshonean"). Clark Wissler (1914) initially extended his Plateau area south to include most Oregon Paiute and Idaho Shoshone, and later lumped them all (except Shoshone) with the Northwest Coast in an expanded "salmon area." Kroeber, in various treatments (1920-39), combined Plateau, Basin and California areas into a single unit (d'Azevedo 1986:10). Recent, more sophisticated culture element studies consistently parcel Northern Paiute into the Basin and Sahaptians into the Plateau (e.g., Driver and Massey 1957; Jorgensen 1980).

Upper Chinookan peoples sometimes have been included in the Plateau and sometimes in the adjacent Northwest Coast Culture Area. Wissler (1914), Kroeber (1939), and Driver and Massey (1957) all place them with the Plateau. Many coastal traits occur within the Upper Chinookan area, as we will see below. David French (personal communication 1989) suggests that the most meaningful divide, considering subsistence, settlement, and other cultural orientations, is in the sparsely utilized stretch of river between Hood River and the

Cascades (a line which corresponds to the western limits of the north-central Oregon study area).

What traits define these two culture areas? For the Plateau, the two best sources are Verne Ray's (1939) *Cultural Relations in the Plateau of Northwestern America* and (1942) *Cultural Element Distributions: XXII Plateau*. The following prominent traits were shared by all Plateau peoples: (1) an emphasis on salmon as a basic resource, taken with weirs, dip nets, and spears; (2) root digging, with a crutch-handled digging stick; (3) the earth oven for roots and meat, and boiling with hot stones; (4) buckskin clothing; (5) two types of stone pipes, and communal smoking; (6) the communal sweatlodge and sweating followed by a cold plunge; (7) winter villages and warm-season camps; (8) named chiefs (with variable duties) and chief's spokesmen; (9) a naming feast; and (10) standardized shamanistic curing, with object intrusion as the usual explanation for disease. Two of the pan-Plateau traits (buckskin clothing and smoking) are very similar to and were obviously influenced considerably by Plains contacts. A Plains overlay is very strong in the eastern half of the Plateau, and for the most part appears to postdate the introduction of the horse in the early 1700s (Haines 1938, 1960).

Upper Chinookan speakers, as noted above, have strong cultural ties with downriver as well as upriver peoples. Important "coastal" traits found between Hood River and The Dalles but lacking or minimally important elsewhere on the Plateau are plank houses, the burial shed, and slavery.

No adequate treatment of the defining traits of the Great Basin Culture Area exists, despite the fact that its distinctiveness has been recognized ever since Mason's original 1896 delimitation of culture areas. Part of the problem is that culture-area surveys of the early forties were done on a sub-regional basis, and no comprehensive region-wide synthesis was ever attempted. Four regional cultural element surveys (Steward 1941, 1943; Stewart 1941, 1942) covered the peoples of Utah, Nevada, and the southern and eastern fringes of the culture area, but skipped peripheral groups in the California desert and (significantly for this report) the southeast quadrant of Oregon. This south-east bias has never been corrected, and works based on the culture element surveys are marred by it. Nevertheless, two works are important here. Julian Steward's *Basin Plateau Socio-Political Groups* (1938) defined what he called the "family level of socio-political organization," with nuclear and extended families moving and regrouping in relationship to seasonal changes in availability of a broad spectrum of foods; situational leadership and undeveloped political institutions; and a portable material culture.

Also based on the element lists, with additional input from areal archaeology, is Jesse Jenning's "Desert Culture." His most recent definition lists these prominent material traits:

> ...an intensive, unrestricted exploitation of [many] species [as opposed to a few]; small-seed harvesting and consequent special cookery of mushes and cakes; fur cloth; woven sandals; the atlatl and dart [attested only archaeologically]; a wide variety of small projectile points; knives (both large and small); flat and basin nether millstones;...[etc.] (1974:156-157).

The "Desert Culture" concept has been strongly criticized by archaeologists (e.g., Fowler and Jennings 1982), but still is useful as a general guide to what one might expect to find (as far as material remains are concerned) in Great Basin cultures. In the southern third of the north-central Oregon study area, significant variations on this general model reflected a distinctive ecological base (arid but not desert, with permanent waterways) and proximity to and resultant sharing of particular traits with the Plateau Culture Area.

LANGUAGE

Four major languages were spoken in the north-central Oregon study area: Molala, Upper Chinook, Sahaptin, and Northern Paiute (Table 3.1). Molala was a language isolate (Rigsby 1966), but the others were members of the Chinookan, Sahaptian, and Uto-Aztecan language families, respectively. Sahaptin, and probably Upper Chinook, were spoken in more than one dialect. Visitors, slaves, and inmarried spouses spoke these four and numerous other languages (Cayuse, Nez Perce, other Sahaptin dialects, Klamath, etc.) from outlying regions. In the nineteenth century, Chinook Jargon, English, French, and others were added.

While a "Penutian" phylum has been postulated to include Chinookan, Sahaptian, and Molala, as well as other language families and isolates inside and outside Oregon (Sapir 1949:170), the historical work necessary to demonstrate the relationships has never been carried out. As Scherzer (1976) has shown, the region constitutes a "speech area" or Sprachbund, characterized by the spread of phonetic and other features across linguistic boundaries which are thereby obscured. This makes careful identification of borrowings among languages necessary before genetic relationships can be determined. Such work has scarcely begun; attention has focused on distant relationships rather than on those within language families (Campbell and Mitchum 1979:18-22). Many linguists are waiting to see the evidence that "Penutian" includes anything more than its core of certain California languages (e.g., Campbell and Mitchum 1979:44-45). Others, like many non-linguists, accept the larger Penutian as fact, not hypothesis. Finding enough evidence to establish a "Penutian" phylum may be impossible, given the remoteness of the postulated connections within it; a similar search to link the Indo-European and Semitic language families has so far been unfruitful for the same reason.

The distribution of languages (or, rather, of speakers) is difficult to map, for several reasons: long-term shifts of population, speeding up after White contact; the multilingualism of individuals and of settlements; cyclical shifts of residence; and the abandonment of one language in favor of another without a shift in population. The contacts between and movement among local groups also are responsible for the development of a "speech area": for instance, the widespread distribution of some numerals across languages probably came about through gambling (Dale Kinkade, personal communication 1989). In short, to understand the relationships among languages in the region, social processes must first be understood.

Table 3.1. Indigenous Languages of the North-Central Oregon Study Area (D. French, personal communication 1989; Miller 1986:98-99; Rigsby 1965).

- Upper Chinook (Chinookan Family)
  - dialects: Cascades
    - Wasco-Wishram
- Sahaptin (Sahaptian Family)
  - dialect cluster: Columbia River
  - dialects: Tygh
    - Tenino
    - Celilo
    - John Day
    - Rock Creek
    - Umatilla
- Northern Paiute (Uto-Aztecan family, Numic branch)
- Molala (language isolate)

SUBSISTENCE

AQUATIC RESOURCES

Traditionally, salmon has been considered the staple resource of the Northwest Coast and Plateau culture areas, as well of most of the aboriginal groups of the Columbia River drainage. This characterization is oversimplified, however, and obscures two important points: First, there were several species of salmon, each with different times and places for runs and spawning. Some drainage systems had several species; others had none. Second, throughout much of the Columbia drainage, plant foods were more important--in both the total diet and as far as cultural effects were concerned--than were aquatic resources (Hunn 1981, 1990).

In the north-central Oregon study area, three salmon (Oncorhynchus) species occurred and were taken in significant quantities by natives. Coho (O. kisutch) run mostly in October, and ascend the Hood and John Day rivers to spawn. Sockeye (O. nerka) run in August and spawn in interior lakes; Suttle Lake on the upper Metolius is the only sockeye lake in the north-central Oregon study area. Chinook salmon (O. tschawytscha) appear in the Columbia in three runs: spring, summer, and fall. The spring run peaks in April; summer in July; and fall in September. As noted by Randall Schalk (various), there are significant physical differences in spring- and fall-run chinook, which have important cultural ramifications. Spring-run chinook are fat and oily; they do not preserve well and were generally consumed by Indians shortly after capture. Fall-run chinook (and coho) are leaner and drier; appearing in the dry months of early fall, they are easy to preserve, and were captured in quantity to use throughout the winter months. In the north-central Oregon study area, spring chinook appeared in most large tributaries, but the important fall chinook spawned only in Hood River and the main stem of the Columbia (Fulton 1968, 1970). The implications are obvious: people who lived on these waterways had a subsistence advantage over those who did not.

Ethnohistorical studies show quite clearly that, throughout the Columbia drainage, interior peoples (i.e., those on streams with fewer salmon runs) travelled seasonally to the banks of run rivers to fish (Boyd and Hajda 1987). The movement to the fisheries was by individuals or small family groups, and the rights to use fishing stations were gained through intermarriage (cf. Walker 1967). Dwellers in fall-run chinook areas were blessed with salmon surpluses, which were processed by special methods and traded to outsiders (quite likely, those who received salmon in trade did not have local fishing rights of their own). Fish processed for local consumption was flensed and air-dried on tule mats atop scaffolds. According to one informant 25 pounds of fresh fish equalled 3-4 pounds dried (Jasper Tufti, Bonneville Dam Fishing Rights Testimonies, 1937). Apparently, the greater part of salmon which was traded was processed by air drying and pulverizing in large wooden mortars with heavy stone pestles (Curtis 1911:8:94). It was much less bulky and lighter than fresh or flensed and air-dried fish, and (according to Lewis and Clark 1904-05:3:155) was stuffed into large mat baskets for trade. Pulverized salmon was a specialty of The Dalles area.

Peoples on interior streams that lacked salmon, and who did not have marital ties or trading partnerships with riverine peoples had to find alternate means of surviving through the winter. It is notable that the area historically inhabited by Paiute speakers had only small runs of spring chinook (Crooked River) and sockeye (Metolius to Suttle Lake).

Other fish species, with variable distributions, were also important in the north-central Oregon study area. A glance at Table 3.2 gives a rough idea of relative importance. Lampreys and sturgeon were taken by downstream peoples (though Columbia Sahaptins did not eat sturgeon); trout--both fresh and sea-run--were present nearly everywhere, and various small fishes were available locally. Downstream peoples took suckers (Catostomus) and the northern squawfish when they spawned in streams in spring (the former appeared early in Columbia tributaries and were welcomed by Columbia Sahaptins with a first-fruits celebration). Various species of daces (Richardsonius) were available throughout but taken only by Paiutes. Two other aquatic (but non-piscine) sources should be mentioned here. Ethnohistorical sources note that harbor seals were present in the Columbia Gorge, and (at least at The Cascades) were an important source of oil. In rapid-flowing tributary streams, particularly in the Sahaptin area, river mussels (Margaritifera falcata was most abundant) were collected (Lyman 1980).

Fishing technology was closely associated with the abundance and importance of fish in the total diet plus the species available and the best methods of capturing each. The fishing technology used by the riverine peoples for salmon was much more complex than that of the interior peoples. Dip-nets--of two varieties--were most common. The regular dip or sweep net moves with the current and catches fish travelling upstream. The stationary set or bag net is larger and catches fish moving with the current, generally in eddies. Best dip net sites are narrows and rocky cliffs and islands, where fish runs are close to shore. Scaffolding or platforms of fir often were extended out into the river to get closer to the fish. Dip net hoops were made of vine maple with netting of Indian hemp cordage. Seines are reported occasionally for both Chinookans and Sahaptins. Wooden floats (billet or bottle shaped) and

Table 3.2. Food Fishes of north-central Oregon (Based on Hunn [1980] and Fowler [1986]).

Taxon	Common Name	Northern Paiute	Columbia Sahaptin
Lampetra richardsoni	lamprey		X
Acipenser transmontanus	white sturgeon		X
Oncorhynchus	salmon		
O. keta	chum, dog		(extra-limital)
O. kisutch	coho, silver		X
O. nerka	sockeye, blueback	X	X
O. tschawytscha	spring/summer chinook	X	X
O. tschawytscha	fall chinook		X
Salmo	trout		
S. gairdneri	rainbow, steelhead	X	X
S. clarkii	cutthroat	X	X
Salvelinus malma	Dolly Varden	X	X
Prosopium williamsoni	whitefish	X	X
Catostomus	sucker		
C. columbianus	bridge-lipped	X	X
C. macrocheilus	large-scaled	X	X
C. platyrhynchus	mountain	X	
Ptychocheilus oregonensis	northern squawfish	X	X
Achrocheilus alutaceus	chiselmouth		X
Richardsonius balteatus	redside shiner	X	X
Rhinichthys	daces		
R. cataractae	longnose	X	
R. falcatus	leopard	X	
R. osculus	speckled	X	
Margaritifera falcata	river mussel		X

grooved stone sinkers were used with seines, as were rectangular wooden or elkhorn net gauges. River peoples used wooden clubs to dispatch captured salmon.

All peoples of the area used fish spears; the Chinookans favored the two-pronged type for fall salmon, while others used the single-pronged variety. Capturing devices of twined willow were used, mostly on tributaries, throughout the study area. These included weirs, funnel traps, and basket traps at falls (not reported for Chinookans). Simpler methods were used more often by interior peoples. The (bone) hook-and-line was used for mid-sized fishes, and rock dams and fish poison (Lomatium dissectum) for smaller species. Paiutes also used the bow-and-arrow and waded into the water to catch fish by hand.

PLANT FOODS

Plant gathering, of course, had to be coordinated with fishing and hunting, and this might lead to an emphasis on one food to the exclusion of others, or a division of labor between men and women. At the time of the spring salmon run, men were at the fisheries while women gathered lomatiums in the surrounding hills. Family groups participated in the late summer/early fall mountain huckleberry harvest, and then descended to the river for the important fall chinook run. While men helped gather berries and did all the fishing, women were responsible for processing both foods. A potential conflict in scheduling occurred with large game, which were best taken at the time of the fall salmon run (Hunn various). Most north-central Oregon peoples depended upon the more abundant fish resource for their protein supply; hunting as a major subsistence activity tended to be practiced by those peoples who did not have ready access to fisheries (e.g., upriver Sahaptins, Molala and Paiute).

The traditional view was that salmon composed "at least 50%" of the diet for "most Plateau groups" (Walker 1967:9), but more recent analyses, which take into account local variations and the heavy use of plant foods, suggest that 40% of the caloric intake would be closer to the truth (Hunn 1990). Table 3.3 summarizes the ethnographic and ecological data on wild plants utilized as food by the peoples of the north-central Oregon study area. A distinction that often has been made by outsiders is between root crops and seeds. There is a definite difference between Plateau and Basin peoples in this respect, though it tends to be hazy along the boundaries of the culture areas. The chart shows that, among Paiutes, seeds and roots have an approximate equivalence in numbers of utilized species. On the Plateau, utilized roots easily provided the bulk of the plant foods; seeds were virtually unexploited. (The relative unimportance of wild berries (with the exception of Vaccinium spp. and Ribes aureum) throughout all the north-central Oregon study area is in marked contrast to the adjacent Northwest Coast Culture Area, where genera such as Rubus, Berberis and Gaultheria shallon were extremely important.)

Columbia Sahaptin speakers dichotomize their plant foods into two large categories: "foods which are dug" and "foods which are picked" (Hunn 1982:27,32). Hunn (1990) has ranked the most important foods in the first category as follows:

Lewisia rediviva (bitterroot)
Camassia quamash (camas)
Lomatium cous (kous)
Lomatium canbyi
Perideridea gairdneri (yampa)

Bitterroot usually was harvested between April and June, as were the lomatiums; camas in June; and huckleberries (the most important of "foods which are picked") in September.

Table 3.3. Food Plants of north-central Oregon. Basic list from Fowler (1986). Distributions checked against Hitchcock (1973) and Peck (1961). Secondary Paiute sources: Couture et al. (1986) (Harney Paiute), Mahar (1953) (Warm Springs Paiute). Sahaptin/Wasco-Wishram sources: Hunn (1990), French (n.d., personal communication 1989).

Taxon	Common Name	Northern Paiute	Columbia Sahaptin
Fungi			
Agaricus sp.	agaric mushroom		X
Lichen			
Bryoria fremontii	black tree lichen		X
Cupressaceae	cypress		
Juniperus occidentalis	western juniper	X	medicine
Pinaceae	pine		
Pinus albicaulis	whitebark		X
P. lambertiana	sugar		X
P. ponderosa	ponderosa	X	
Tsuga heterophylla	western hemlock		marginal
Betulaceae	birch		
Alnus rubra	red alder	X	
Corylus cornuta	Oregon hazelnut	X	X
Fagaceae	beech		
Quercus garryana	Garry oak	X	X
Chenopodiaceae	chenopod		
Atriplex sp.	saltbush	X	
Chenopodium fremontii	Fremont's goosefoot	X	
Suaeda depressa	Pahute weed	X	
Portulaceae	purslane		
Claytonia lanceolata	lance-leaf spring beauty		X
Lewisia rediviva	bitterroot	X	X
Berberidaceae	barberry		
Berberis spp.	Oregon grape		X
Cruciferae	mustard		
Descurainia pinnata	tansy mustard	X	
Lepidium sp.	pepperweed	X	
Rorippa curvisiliqua	yellow cress	X	
Grossulariaceae	currant		
Ribes aureum	golden currant	X	X
R. cereum	squaw currant	X	X
R. lacustre	swamp gooseberry	X	X
Ericaceae	heath		
Arctostaphylos nevadensis	pine-mat manzanita	X	
Vaccinium deliciosum	Cascade blueberry		X
V. membranaceum	mountain huckleberry	X	X
V. ovalifolium	oval-leafed blueberry	X	X
V. oxycoccus	bog cranberry	X	X

Table 3.3. (Continued).

Taxon	Common Name	Northern Paiute	Columbia Sahaptin
V. parvifolium	red huckleberry	X	X
V. scoparium	whortleberry		X
Labiatae	mint		
Mentha arvensis	field mint	X	X
Scrophulariaceae	figwort		
Pentstemon speciosus	showy pentstemon	X	
Caprifolaceae	honeysuckle		
Sambucus cerulea	blue elderberry	X	X
Sambucus racemosa	red elderberry		marginal
Valerianaceae	valerian		
Valeriana edulis	tobacco-root	X	X
Compositae	composite		
Artemisia tridentata	big sagebrush	X	
Balsomorhiza	balsamroot		
B. careyana	Carey's		X
B. hookeri	Hooker's		X
B. sagittata	arrow-leaved	X	
Chrysothamnus nauseosus	rabbitbrush	X	
Cirsium scariosum	thistle	X	
Microseris sp.	microseris	X	X
Wyethia amplexicaulis	mule-ear wyethia	X	
Cyperacea	sedge		
Scirpus validus	tule	X	
Gramineae	grass		
Alopecurus aequalis	short-awn foxtail	X	
Elymus canadensis	Canada wildrye	X	
Elymus cinereus	giant wildrye	X	
Oryzopsis hymenoides	ricegrass	X	
Typhaceae	cattail		
Typha latifolia		X	
Rosaceae	rose		
Amelanchier alnifolia	serviceberry	X	X
Crataegus douglasii	hawthorne	X	X
Fragaria virginiana	strawberry	X	X
Prunus virginiana	chokecherry	X	X
Rosa spp.	wild rose	X	X
Rubus			
R. idaeus	raspberry	•	•
R. leucodermis	blackcap	•	•
R. parviflorus	thimbleberry	•	•
R. spectablis	salmonberry	•	•
R. ursinus	blackberry	•	•

Table 3.3. (Continued).

Taxon	Common Name	Northern Paiute	Columbia Sahaptin
Leguminosae	pea		
Trifolium macrocephalum	bigheaded clover	X	
Geranium	geranium		
G. viscosissimum	sticky geranium		X
Loasaceae	blazing Star		
Mentzelia laevicaulis	blazing star	X	
Cactaceae	cacti		
Opuntia spp.	prickly pear	X	X
Elaeagnaceae	oleaster		
Shepherdia argenta	buffalo berry	X	
Shepherdia canadensis	soap berry	X	X
Umbelliferae	umbellifer		
Heracleum lanatum	cow parsnip	X	X
Lomatium	desert parsleys		
canbyi	Canby's	X	X
cous	biscuit root	X	X
farinosum			X
grayi	Gray's	X	X
hendersonii	Henderson's	X	
leptocarpum	smooth-fruited	X	
macrocarpum	gray	X	X
minus	small		X
nevadense	Nevada	X	
nudicaule	naked	X	X
piperi	Piper's	X	X
triternatum	narrow-leafed	X	X
Perideridia gairdneri	yampa	X	X
Sphenosciadium capitellatum	woolyhead parsnip	X	
Tauschia hooveri	Hoover's tauschia		X
Cornaceae	dogwood		
Cornus stolonifera	red-osier dogwood	X	X
Lilaceae	lily		
Allium	onion		
acuminatum	Hooker's	X	X
cernuum douglasii	nodding		X
	Douglas's		
macrum	rock	X	X
madidum	swamp	X	
parvum	dwarf	X	
sativum			X
tolmiei	Tolmie's	X	
Brodiaea	brodiaea		
coronaria	harvest	X	
douglasii	large-flowered	X	
hyacinthina	hyacinth	X	X
Calochortus macrocarpus	Mariposa lily	X	X
Camassia spp.	camas	X	X
Fritillaria pudica	yellow bells	X	X
Lilium columbianum	tiger lily	X	X

* = Marginal throughout the area.

Knowledge about the specifics of subsistence activities in the upriver or interior (mostly Paiute) zone is, unfortunately, fragmentary, and must be deduced from what is known about faunal and floral distributions and Northern Paiute subsistence practices in other portions of their range. There is a mosaic of environments in the Central Oregon Paiute zone--from river canyons dominated by sagebrush, to high plateaus with bunchgrass, juniper or ponderosa pine associations, to montane grand-Douglas-fir forests. Throughout Northern Paiute lands, broad-spectrum gathering was the rule, with local inventories determined more by what was found in any given area than any cultural factors. "Food-named groups" were identified by distinctive local resources, which should not be considered "staples" (Fowler and Liljeblad 1986:436). The two food-named groups of Central Oregon--Juniper Deer Eaters and Hunupui Eaters--received their appellations from mule deer and Lomatium macrocarpum, characteristic of their respective regions, but not especially important otherwise.

The technology of root gathering included digging sticks of a hard wood such as service berry (the crutch handle form was found everywhere, straight sticks were limited to the south), gathering bags or baskets, and a peeling knife (Downing & Furniss 1968:50). Peeled roots generally were sun-dried on the spot; this reduced their weight by two-thirds (Hunn 1990). Dried roots could be ground with stone pestles in hardwood or stone mortars at the gathering area or the base camp. Berrying-camp technology included coiled cedar-splint ("Klickitat") berrying baskets and a "berry dryer" consisting of a smoldering log and adjacent banked earth upon which the berries were spread (Filloon 1952:5-6). Dried berries lost 70% of their weight and were easily carried to home villages (Hunn 1990).

The seed harvest, significant within the north-central Oregon overview area for Paiutes only, was associated with a distinctive technological complex involving a range of twined basketry types: a seed beater (usually cup-shaped, with attached handle), a small gathering basket or pan for receiving the seeds, a burden basket for carrying them to camp, and several kinds of close and open woven trays for winnowing, parching, and sifting. The seeds were further processed by grinding (using a mano and metate or mortar and pestle), and were usually cooked as a mush, using hot rocks in cooking baskets.

PLANT-GATHERING AREAS

Prominent resource areas in the north-central Oregon study area can be classified most easily by resource type. Plants in the major Sahaptin category "foods which are dug" tended to be found in two types of environments--each (significantly) with Sahaptin names (Hunn 1990). The word sam can be translated as lithosol patches--areas of rocky, shallow soil which were scattered on slopes throughout (in particular) the sagebrush zone. Lomatium cous, canbyi, piperi, gormanii, macrocarpum, and farinosum grew in sam, as did Lewisia rediviva (bitterroot), Brodiaea hyacinthina, and Claytonia lanceolata. The small, scattered nature of sam patches usually dictated a dispersed gathering pattern by small groups of (usually) related women, or by small family groups (Hunn 1982:29). It has been described for Sahaptins by Hunn (1990) and for Harney Basin Paiutes (certainly applicable to Central Oregon Paiutes as well) by Couture et al. (1986). Occasionally, lithosolic areas were more concentrated, as around Shaniko, and people gathered in larger collocations, as they did in other environments for camas and huckleberries (Hunn 1990). Root-gathering camps were located within walking distance, but not necessarily contiguous with, gathering areas. Water availability was a factor in base camp selection (D. French, personal communication 1989). Sahaptins, at winter villages, cached roots in storage cellars (Hunn 1990).

The second most important environment for "foods which are dug" was tay, translated as "vernal meadows." Prominent species found in tay include camas, yampa (Perideridea spp.), and the hyacinth brodiaea. tay tended to be located at moderate to high, well watered locations. Camas often was found in sizable concentrations, and led occasionally to quite large concentrations of people from numerous winter villages and often of varying languages. Camas gathering and processing has been described most completely (for Nez Perce; probably the same in our area) by Downing and Furniss (1968). The bulbs were gathered with digging stick and hemp bag, and steam baked in an earth oven. The Nez Perce form was 3-4 ft. (about 1 m) across and 2-3 ft. (0.6 to 0.9 m) deep, with layers of wood, rocks, willow branches and rye grass, camas bulbs, and dirt. Cooked bulbs were air-dried, ground with a mortar and pestle, and formed into cakes (Downing and Furniss 1968:50-51).

The Columbia Sahaptin subsistence round was (as regards plant foods alone) altitudinal: lomatiums were gathered first in the spring in lithosol patches in the sagebrush zone; bitterroot next in higher transitional areas; camas in summer in mountain meadows; and huckleberries in early autumn on higher mountain meadows. Hunn (1990) calls this "seasonal upslope mobility...Camps were established progressively further from and higher above the river from April through June."

An environment that stands out from the plant lists is stream banks. Here were found the important Ribes aureum or golden currant (as well as other currants), Heracleum lanatum, Elymus spp. (utilized by Paiute), and in wetter places Typha latifolia, Scirpus validus, and Alopecurus aequalis (see Table 3.3). Dry areas produced most of the seed crops utilized by Paiutes, as well as wild onions (Allium spp.), Calochortus macrocarpus, Brodiaea coronaria and Wyethia amplexicaulis. From foothills came Balsamorhiza spp. and "foods which are picked" (chokecherries, acorns [in scattered groves such as above the city of The Dalles and near Wapinitia,] serviceberries, raspberries, and wild roses).

In higher elevation open areas maintained by fire, huckleberries (particularly Vaccinium membranaceum) were found, often in large concentrations attracting seasonal gatherings of people. The outstanding berrying areas in the north-central Oregon study area were around Mount Jefferson and south of Mount Hood. There were also berry-grounds in the higher elevations of the Blue Mountains, and some south bank peoples annually crossed the Columbia to exploit the large fields east of Mount Adams. Berry camps were set up at the margins of the fields.

The habitats in which Paiute foods grew were, like the plants themselves, diverse. Prominently mentioned in Hitchcock's plant habitat descriptions are lithosolic patches (roots such as lomatiums, bitterroot, onions, and brodiaeas), dry fields (seeds such as sunflowers and mustards, and lily bulbs), streambanks (currants, ryeseeds, cow parsnip), wet meadows (camas, yampa), woods (pine nuts), and mountains (huckleberries). Seasonal rounds of local groups probably were determined by specific local plant abundance and distribution.

Warm Springs field notes (Harper, Hajda and K. French) make clear that buttes were favored places for Paiutes to gather foods. Berries, roots, and pine nuts were collected at Black Butte, Ponderosa pine nuts at Bald Peter; other resource areas included Powell Butte, Prineville Butte, Cottontail Butte, and the summit meadows of Paulina Mountain, a favored place for bitterroot, pine nuts, and hunting. It may be that the more diversified environments of buttes, plus the availability of spring water, made them favored resource areas. The Claims Cases maps show Paiute "camps" in two other environments: in the alpine areas surrounding Mount Jefferson and the Three Sisters, and in several locations along waterways away from the main course of the Deschutes.

HUNTING

In the northern two-thirds of the north-central Oregon study area, hunting was definitely a tertiary activity. For Sahaptins, Hunn (1982:33) mentions mule deer, taken as an adjunct to the autumn huckleberry harvest; and black bear, killed while hibernating. Ray adds elk, antelope, and grizzly bear (1942:116). Small game included jackrabbits, marmots, ground squirrels (two species), and the Douglas squirrel (Hunn 1990; Spier and Sapir 1930:182). Waterfowl apparently were not important (due to a scheduling conflict?), but sharp-tailed grouse and sage hen were taken (Hunn 1990). Two species--mountain goats and bison--occasionally mentioned in the sources were (at least during the historic period) extralimital to north-central Oregon.

Without a reliable fishery resource (either salmonid or lacustrine) Central Oregon Paiutes probably relied on hunting as a source of protein. Among large game, elk were found in the high Cascades and Blue Mountains; mule deer were important in the Cascade foothills, and antelope and the desert bighorn in drier areas (see Table 3.4). Mule deer were taken on the Metolius and near Bend, and antelope at Madras and Prineville. Communal drives involving sagebrush corrals may have been used here as elsewhere in the Great Basin Culture Area. Paiutes took rodents of many species, including jackrabbits (plains), marmots (rocky areas), and golden-mantled ground squirrels (timberlands). Jackrabbits were driven into sagebrush enclosures. The normal means of taking other rodents (clubbing and smoking) should leave no remains. Waterfowl probably were not as prominent in Central Oregon as they were elsewhere in the northern Paiute range, given the local lack of sizable bodies of water for breeding (though several species migrated through the area). Passerine birds (dove, grouse, quail) were abundant enough to be a significant resource. It is probable that, like other Northern Paiute, the Central Oregon peoples ate wasp and ant larvae and crickets (Stewart 1941).

Hunting technology varied little throughout the region. Hardwood bows, usually over three feet, were generally sinew-backed; the bowstring was also of sinew. Arrows had points of flint (Cryptocrystalline silica), obsidian, bone, or the hardwood arrowshaft itself came to a sharp point. Arrows were fletched with hawk or eagle feathers and kept in skin quivers. Hardwood clubs and deadfalls were used by all peoples. Sahaptins and Paiutes used large nets to catch rabbits and waterfowl, and brush enclosures or corrals for antelope. Meat usually was dried on a four-post wooden frame.

Table 3.4. Food Mammals of North-central Oregon. Basic list from Fowler (1986) (Paiute); Sahaptin source Hunn (1990). Distributions checked against Bailey (1936).

Taxon	Common Name	Northern Paiute	Columbia Sahaptin
Lagomorphs			
Ochotona spp.	pika	X	
Lepus	hares		
americanus	snowshoe	X	
californicus	jackrabbit	X	X
townsendii	jackrabbit	X	X
Sylvilagus nuttallii	cottontail	X	X
Rodents			
Marmota flaviventris	yellow-bellied marmot	X	X
Spermosphilus	ground squirrels		
lateralis	golden-mantled	X	
townsendii	Townsend's		X
Eutamias spp.	chipmunks	X	
Tamiasciurus douglasii	Douglas squirrel	X	Chinookans
Thomomys spp.	pocket gophers	X	
Dipodomys spp.	kangaroo rats	X	
Castor canadensis	beaver	X	
Neotoma cinerea	bushy-tailed wood rat	X	
Ondatra zibethicus	muskrat	X	
Erethizon dorsatum	porcupine	X	
Carnivores			
Vulpes fulva	red fox	X	
Euarctos americanus	black bear	X	X
Procyon lotor	raccoon	X	
Mustela vison	mink	X	
Taxidea taxus	badger	X	
Lynx rufus	bobcat	X	
Phoca vitulina	harbor seal		Chinookans
Ungulates			
Cervus canadensis	Rocky Mountain elk	X	X
Odocoileus hemionus			
O. h. hemionus	mule deer	X	X
O. h. columbianus	black-tailed deer		Chinookans
Antilocapra americana	pronghorn antelope	X	
Ovis canadensis	desert bighorn	X	

Some variation existed in cooking technology, correlated closely with available raw materials. All peoples used the earth oven for roots, and roasted meat on sticks or in coals. Stone boiling was usual: twined baskets were used everywhere; Chinookans also had granite bowls, and Paiutes coiled baskets covered with pitch (Whiting 1950:98). The riverine peoples had both hardwood and horn serving bowls; coiled basketry was more important among Paiutes. All peoples used mountain sheep horn spoons; hardwood spoons were common among riverine peoples, while (Harney) Paiute used a spoon made of "plaited grass and juniper." (Whiting 1950:98).

SETTLEMENT PATTERNS

A discussion of subsistence rounds leads easily to consideration of settlement patterns, as the latter were strongly influenced by the former. Climatic considerations and availability of raw materials were other determining factors.

Throughout the north-central Oregon study area (as throughout the Northwest Coast, Plateau, and much of the Great Basin), the year was divided climatically in two, with varying residence patterns appropriate to each half. During the cold season, people were concentrated in a few winter settlements; when the weather became warmer they moved from one campsite to another, dependent upon the harvest times for locally available resources. For the Plateau, Ray states: "On the whole Plateau life involved wintertime occupancy of river villages, and summertime camping at fishing, berrying, and root-digging grounds" (1939:14).

The archaeological manifestations of this pattern are (1) winter settlements, which should contain concentrations of remains of relatively substantial dwellings, plus a relatively high density of artifacts, and (2) a wide range of resource areas, with more elusive remains of structures, but concentrations of artifacts specific to the gathering and processing of particular wild foods. Figure 3.1 shows ethnographically known winter villages and warm-season camps and important resource areas within the north-central Oregon study area.

Some predictability was involved in the siting of these places. Winter settlements were selected on the basis of several factors, among which were availability of potable water, protection from the elements and availability of fuel for warmth, and the proximity of important foods. Ray's statement about siting of winter villages along rivers holds in general for the Chinookans and Sahaptins of the northern two-thirds of the study area (see Figure 3.1). For the upper Deschutes and John Day Paiutes, maps prepared for Indian Claims Cases appear to indicate a similar pattern (Lyman et al. 1983:Figure 4.3). Winter villages along the banks of the Columbia were preferably sited in areas that provided protection from the elements, in particular the cold east wind that blows down the Gorge in winter. David French (personal communication 1989) makes the interesting observation that most Chinookan villages in the area tended to be located on the north or "sunny side" of the river. Curtis (1911:8:91) states that the availability of firewood was a factor in Upper Chinookan village siting. In the Paiute area, one would expect to find winter settlements in protected canyons. Fuel, for these peoples, would not be a problem, as they used the ubiquitous sagebrush.

Availability of foods has been suggested as a factor in winter village siting (Saleeby 1983), and to a certain extent this is true. In the Chinookan zone, most villages known to be occupied during the winter (in the nineteenth century) were located at sites advantageously positioned to take advantage of the fall chinook salmon run. In the Columbia Gorge, winter villages were sited near the mouths of tributary streams; upriver villages tended to be near rapids or falls where fish could be taken easily. Above Celilo Falls, proximity to fisheries appears to have been less important as a factor in winter village siting.

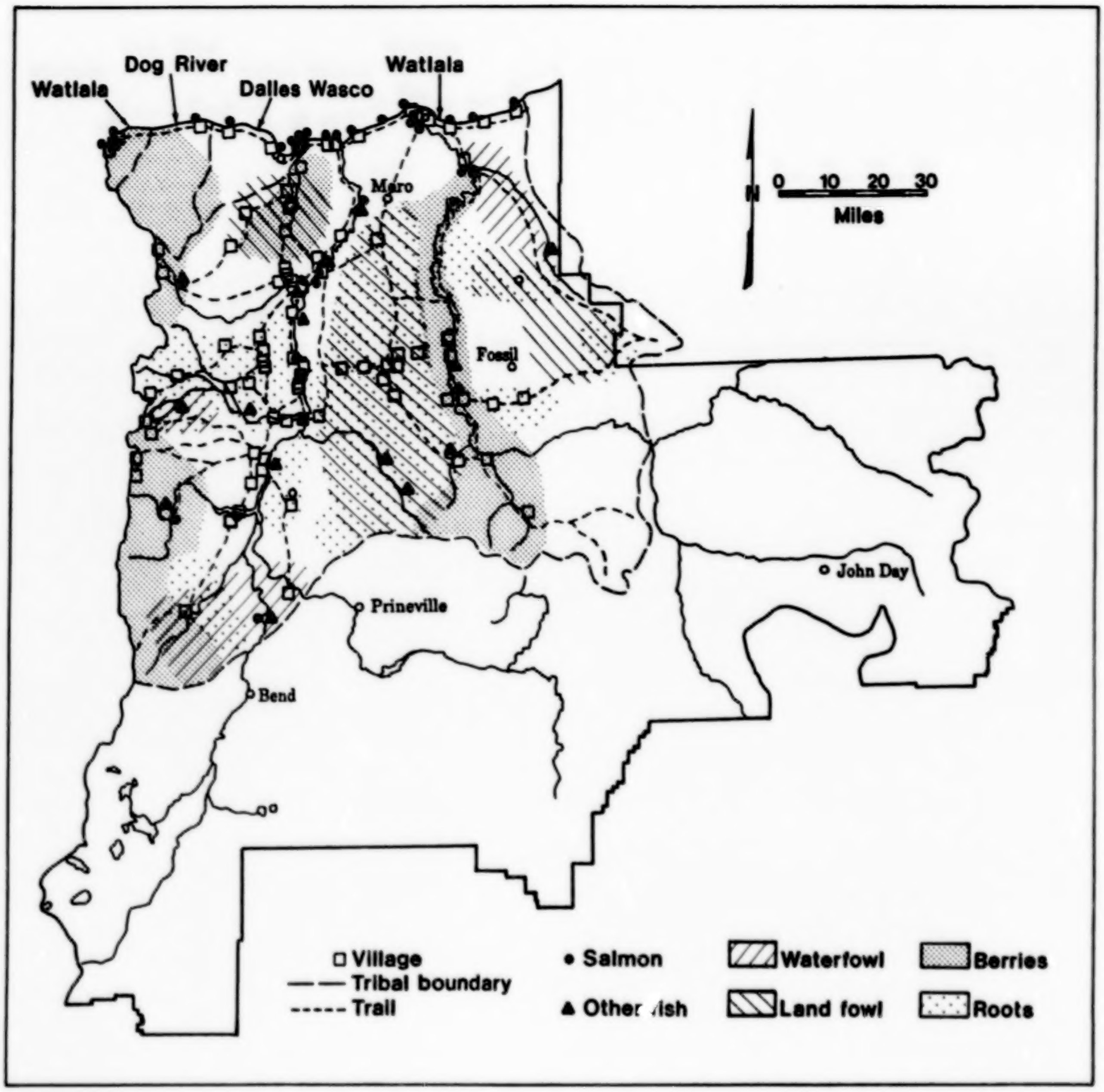


Figure 3.1 Ethnographically Documented Winter Villages and Important Resource Areas of the Wayampam, Dalles Wasco, Dog River, and Watlala Tribes (Compiled from maps prepared by Ray [Indian Claims Commission 1960]).

Finally, it should be noted that winter villages were not completely static, and though sited within a restricted zone, might shift slightly from one year to the next. The Rock Creek Indian William Yallup stated in the early 1940s that "permanent camps were not necessarily in the same place each winter . . . however they were ordinarily in the same vicinity" (Swindell 1942:163).

Identifying ethnographically known winter villages along the middle Columbia is an exceedingly difficult task, for two reasons. First is lack of precision, on the parts of both ethnographic interviewers and informants, concerning the definition of "village." The "village" locations recorded by the earliest ethnographers include places that cannot be verified as true winter villages, and may have instead been summer fishing camps, fishing stations, or even place names, with no associated occupation, seasonal or otherwise. Another problem arises due to the considerable depopulation from epidemics of introduced diseases between 1775 and 1834. Several winter villages were abandoned and replaced by sites which were visited seasonally for resource collecting or other pursuits. Comprehensive archaeological surveys, which might help clear up this problem, are now difficult because so many sites have been submerged under the waters of Bonneville, The Dalles, and John Day dams.

The two most recent, comprehensive lists of winter villages are French n.d. (Chinookans) and Rigsby 1965 (Sahaptins). The standard ethnographic lists of Chinookan settlements are Curtis (1911:8:180-181) and Spier and Sapir (1930:164-171). For more recent treatments see Boyd n.d. and Saleeby and Pettigrew (1983). On Sahaptins see also Hunn 1990 and Murdock 1980.

The two most recent comprehensive lists of winter villages are French (n.d.) (Chinookans) and Rigsby (1965) (Sahaptins). The standard ethnographic lists of Chinookan settlements are Curtis (1911:8:180-181) and Spier and Sapir (1930:164-171). For more recent treatments see Boyd (n.d.) and Saleeby and Pettigrew (1983). On Sahaptins see also Hunn (1990) and Murdock (1980).

Paiute winter villages (perhaps "camps" is a better word) were much more amorphous and transitory than the winter villages of the Columbia River peoples. Given the social organization (nuclear and extended families rarely grouping in aggregates larger than fifty people) and technology (grass lodges and portable goods) this is not surprising. Very few winter camps are known from the ethnographic sources. Field notes from the Warm Springs area (Harper; Hajda and K. French) mention winter camps on Seeksequa Creek and at the junctures of the Warm Springs and Metolius rivers with the Deschutes. Horr's Claims Cases maps show the latter two sites and add "villages" at the juncture of Tenino with Shitike Creeks, at two locations on the east side of the Deschutes downstream from Willow creek, at the mouth of Seeksequa Creek, the juncture of Jefferson Creek with the Metolius, where Indian Ford Creek enters Squaw Creek, and near the mouth of Ochoco Creek (at Crooked River).

Some confusion arises from the occasional mention in ethnographers' field notes of Paiute "winter camps...on hills with junipers" or Paiutes "living" near buttes. The Claims Cases maps show two "villages" at locations away from watercourses. In the Great Basin, according to Julian Steward (1970:18), where permanent watercourses were rare, Paiutes did indeed set up winter camps at the bases of buttes where permanent springs were located. Perhaps Central Oregon Paiutes had winter camps in both areas.

STRUCTURES

Winter dwellings have strong linguistic, temporal, and areal associations. The wood house was solely Chinookan; pit houses were the old form for river peoples; mat lodges were preferred after the appearance of the horse. Paiutes had conical dwellings.

The wood house was made of red cedar, a probably limiting factor (Thuja plicata was available only in the Columbia Gorge). It had a frame of four corner poles, eave poles, and a ridgepole. Planks for siding were set vertically and lashed into place. There was a gable on either end, and the house was multifamily. Working with cedar required a specific "tool kit," shared with coastal peoples but not apt to be present in interior areas where red cedar was absent. The kit included straight adzes, flint chisels, elk antler wedges, and stone hammers ("mauls" or "pile drivers").

Semi-subterranean houses are reported for the early contact period in the riverine area. They were apparently the winter structures of choice throughout the prehistoric Plateau. After the appearance of the horse they appear to have become less common, replaced by more easily moved mat dwellings. The north-central Oregon pit house was circular, about 1 to 2 feet (30 to 60 cm) deep, with a superstructure of converging poles covered with tule mats and (sometimes) dirt.

The regional form of mat lodge was most common (in the north) during the historic era. It was rectangular, 12 to 16 ft. (3.7 to 4.9 m) wide, and around 30 to 40 ft. (9 to 12 m) long, occupied by several nuclear families. The mat lodge sat directly on the ground or over a shallow depression. The frame was of fir with a covering of tule mats. Chinookan structures had vertical walls and a gabled roof, like their plank houses; Sahaptin structures (as elsewhere in the Sahaptin range) an inverted V-section (Ray 1936:138).

The Paiutes' conical lodge was small and easily moved. It was usually not excavated, and accommodated only a nuclear family. It had a willow frame and tule mat or grass covering.

All peoples of the region shared the "Plains" variety of sweat lodge. It was a domed willow structure which held only a few people. The cover was tule mats and (usually) earth. There was a small pit for hot rocks which were doused with water to make steam. Menstrual huts, also found in the area, were similar in form.

Three additional types of temporary structures are reported for Sahaptins: a simple lean-to, the flat-topped ramada, and conical lodges covered with mats or hides. Paiutes may have shared the former two structures (Whiting 1950:94).

TRANSPORTATION

A paramount concern to the non-agricultural peoples of the Pacific Northwest, given the geographically scattered and temporally restricted nature of their resource base, was what Schalk has referred to as the problem of "moving people to resources and resources to people" (in Adams 1981:375). Methods of moving products to consumers and vice versa might take several forms. The most simple, in this hunting and gathering region, was the seasonal movement of people to resource areas--or the subsistence round--discussed above. But we have not yet discussed the modes of movement per se, nor the technology connected with them.

Along the Columbia, water transport was important. The usual form was the dugout canoe; above The Cascades two varieties were known from the ethnographic and ethnohistorical literature. The larger "Chinook" or "Nootka" variety was not known to be made locally, and did not occur above Three Mile Rapids. Shovelnose canoes were used by all riverine peoples. Paddles were of ash or cedar, 3 to 6 ft. (1 to 3 m) long; Chinookan informants reported hardwood bailers; Sahaptin bailers were made of twined tules. The Central Oregon Paiute mode of water transport is unknown; the tule balsa rafts of the Great Basin lakes would probably not have been useful in this region of rapid rivers.

Usually not mentioned in discussions of Northwest canoes, but certainly important, was their frequency in the general population, and restrictions on use. Ownership was probably limited (on the Northwest Coast model) to those individuals with the wealth and labor access necessary to build a canoe. Above Crates Point raw materials for canoe building were lacking; between Three Mile Rapids and the head of Five Mile Rapids the river was too rough for intensive canoe use. Anecdotal evidence from the Seufert fishing rights testimonials in the early 1900s suggest that in The Dalles area "big men" owned canoes, and may have had some control over the few regular portages between settlements and fisheries on the north and south banks of the river (four were reported between nixlúidix and the city of The Dalles). In the north-central Oregon study area, canoes were most heavily used probably in the Columbia River Gorge; in the Wasco-Wishram and Columbia Sahaptin zones, where most fishing took place on riverbanks, they were probably used most often for crossing the Columbia and for trade along the lower river.

Most movement between resource areas was (during the pre-horse period) on foot. Regularly used trails connected resource areas. Several of these were mapped by Verne Ray (Figure 3); George Murdock has discussed some in his 1980 article on the Tenino. The only in-depth study of an aboriginal trail per se is the Norton et al. (1983) ethnohistorical reconstruction of resource areas along the early contact period "Klickitat Trail" in Sahaptin territory of south-central Washington. This trail consisted of several resource areas and named campsites distributed at regular intervals between Vancouver Lake and the huckleberry grounds near Mount Adams. Each one of the named places along the trail is a potential archaeological site, regardless of whether it was an actual resource area or merely an overnight campsite. The trails shown on Ray's maps and briefly described by Murdock appear to have been very similar in nature.

In pre-horse times, distance travelled and amount and kind of materials transported certainly were more restricted than was the case later. Chances are that, throughout this period, seasonal movements were not as far-ranging, and winter villages were restricted to regions characterized by closer "packing" of subsistence resources. There may have been less selectivity in types of resources used, and something more like the broad-spectrum gathering of the Paiute may have been more common among the peoples of the northern two-thirds of the study area. The broad social networks and large multi-ethnic task force concentrations of the historic era probably had earlier counterparts of much lesser magnitude. The Plateau Culture Area probably was more similar in many basic ways to the Great Basin Culture Area than was true in the historic period.

Before the horse, the usual method of carrying throughout the study area was by tumpline. Dogs and travoises were not used, and women were the usual carriers. The tumpline was made of hide or of woven fibers such as Indian hemp or the inner bark of willow, and was usually used with a burden basket: a woven (close or open, usually twill-twined) conical basket in the interior; a flexible hide or open-twined fiber bag to the north. A pitch-sealed close-twined water bottle, with pointed or rounded base and narrow neck, was especially characteristic of the arid interior. The locally favored form of twined basketry container--flexible cylindrical or pouch-like bags to the north, bowl-shaped baskets in the interior--everywhere served for storage as well as transport. In the north, coiled cedar-splint baskets with imbricated designs, usually received through trade from Washington Sahaptins, also were so used (Table 3.5). Northern women carried babies in cedar cradle boards with hoops over the face and buckskin wrapping and lashing through holes on the board; Paiutes used oval basketry cradles. Chinookans added bound padding over the forehead for headflattening.

Table 3.5. Ethnographically-Recorded Features of Twined Basketry Technique.

	Wasco-Wishram	Columbia Sahaptin	Northern Paiute
Materials	rush bark fiber Indian hemp	rush bark fiber Indian hemp	rush willow splints
Techniques	plain wrapped	plain wrapped twilled checked (rush work)	twilled (close and open work) plain (open work)
Ornamentation	wrapped twining varying dyed and undyed elements	overlay	dyed structural elements varying weave types

ECONOMICS

Besides moving people to resources, another way to solve the allocation problem is to move resources to people. The word "trade" carries connotations which tend to mask the realities of exchange in north-central Oregon. As will be discussed in the section on social organization, many goods circulated via kinship networks. Intermarriage brought with it economic rights and privileges. Throughout the region gifting was general among in-laws, and exchanges occurred at weddings. Intermarriage also brought rights to use certain resource areas--such as fishing stations--that were normally considered the property of extended families. Beyond this, there were specialized trading relations--best exemplified by the institutionalized trading partnerships recorded for Wasco-Wishram by David French (1961:347). Trading partners usually were people from different ethnic groups who had access to specialties peculiar to their own regions. Finally, some commodities circulated through gambling (summarized from Boyd n.d.).

Items that were highly desirable and limited in distribution, or extralimital to the region, might circulate over great distances. Foods in this category included pounded salmon (produced by Wasco-Wishrams), wapato (Sagittaria latifolia--a specialty of Portland Basin Chinookans), and wocas (waterlily seeds--Nuphar polysepalum, from the Klamath). Some local specialization existed in hunting, berry gathering, and root digging, and movement of these foods in their processed form to consumers in areas where they were less common. Basically utilitarian goods that moved from one area to another included obsidian (Central Oregon Paiute), fine baskets, elk and mountain goat products (northern Sahaptins), bison hides and products and horses (eastern Sahaptians), and slaves (Klamath) (Anastasio 1972:136; Wood 1980:102). Many of these items probably circulated in sizable quantities only in the late prehistoric and early historic periods. Shells--Dentalium, Olivella, and Haliotis, all ultimately from limited regions on the Pacific Coast, were more purely wealth items, often worn on the person as "jewelry." At least on the Columbia below the Dalles, wealth goods such as shells, furs, canoes, and slaves were seldom exchanged for food, which circulated separately. Along the Columbia, as generally in western Oregon, California, and Washington, dentalia served as a medium of exchange for other wealth goods (Hajda 1987).

Obsidian deserves special mention. Volcanic glass was rare in the Pacific Northwest north and west of Central Oregon, though it was highly valued for tools. Some of the most important obsidian sources for aboriginal Oregon and Washington were in the territory of the Central Oregon Paiutes. One source has been identified in the upper John Day; five in the upper Deschutes and Crooked River area (at Three Sisters, Newberry Caldera, Cougar Mountain, Glass Buttes, and Squaw Butte) (Carlson 1989:map). Obsidian from these sources has been identified as far north as the lower Fraser Valley.

Much circulation of goods took place in The Dalles area during the summer and fall fishery, when the population was increased significantly by the presence of outsiders. The visitors fished (with rights obtained through intermarriage), gifted, exchanged goods through trading partners, and gambled. Similar scenarios took place (on a lesser scale) wherever large numbers of people came together for resource gathering. This was the case at certain camas grounds (e.g., Ross 1956 :22-28) and huckleberry fields (e.g., Desmond 1952). To the south, concentrated resource areas such as the Sherar's Bridge fishery and Shaniko root grounds probably also witnessed considerable circulation of goods.

By the early contact period, there was increased movement of peoples outside of their home territories to gather foods and exchange goods. Physically, much of this movement was made possible by the horse. Sahaptian peoples began to move south to take advantage of the resources of the Paiute lands. As Paiute resources were scattered and resource areas were not considered private property, they met little resistance. In the 1840s, task groups composed of leaders from several Sahaptin groups, Nez Perces, Cayuse, and possibly even Salishans, made long distance trips to the California central valley to hunt and trade (Heizer 1942; Stern, personal communication 1989) and occasionally individuals or small parties of men from the north-central Oregon study area participated in the annual migration of large segments of eastern Plateau populations to the Great Plains to hunt bison (Anastasio 1972). Also in the 1840s, large numbers of Cayuse and Nez Perce annually wintered at The Dalles (Boyd n.d.). Finally, we should note that by the mid-1800s, and possibly earlier, a few Paiutes came to the Columbia to fish (Hajda and K. French field notes); they probably had gained fishing rights through intermarriage with Sahaptins.

As far as archaeological manifestations of exchange patterns are concerned, gambling is the one mode of exchange which leaves readily identifiable artifacts. The hand-game was popular region-wide; gaming pieces were short bone (or wood, horn) cylinders, sometimes tapered. Dice were also made of bone. Other intergroup activities included shinny, played by the northern peoples using a hardwood ball and crooked sticks; Paiutes played several games using a stuffed skin ball. Willow hoops were used in several games region-wide. Smoking was another social activity with archaeological manifestations. All peoples used the elbow pipe with a stone bowl and wooden stem; Sahaptins also had tubular pipes of either wood or stone.

SOCIOPOLITICAL ORGANIZATION

In general, variations in pre-reservation social organization in the north-central Oregon study area correlate better with ecological than with linguistic differences. Only the Paiute-Sahaptin "boundary" coincided to a degree with differences in social organization, and that only in some places and at certain times. Social differences between Wasco and Sahaptin speakers were essentially non-existent, since changes were gradual along the Columbia: the linguistic boundary did not coincide with any noticeable break in social organization. Certain generalizations apply to the whole district, whatever language was spoken:

(1) Kinship was reckoned bilaterally, and marriage between known consanguineal relatives was banned. Since residence groups consisted mainly of relatives, and some tendency toward viri- and patrilocality existed, this led to the creation of wide-ranging networks of affinal and consanguineal kin, crossing linguistic and other boundaries.

(2) Autonomous social units were no larger than the villages of a few hundred people found along the Columbia, and might be as small as the family clusters found in the south and southeast, where in areas with more resources winter encampments became permanent

villages as well. Residence changed seasonally in response to the availability and location of resources, with the larger winter groups breaking up into smaller family groups or task groups for some resource-gathering activities in warmer weather.

(3) A sexual division of labor was coupled with a slight degree of occupational specialization, shamans being the most distinctive.

For all areas, especially in the south-southeast interior, most of the information is post-reservation, so that the picture of earlier times may be distorted by the effects of decades of reservation life. A more detailed discussion of the above three points follows.

(1) All the kinship systems recognized relatives through both the mother and father equally. The choice of a spouse was limited only by a prohibition on marriage between consanguineal relatives; not surprisingly, sibling terms were applied to all cousins. (The kin terms, while differing lexically, make near-identical semantic distinctions for all but own and siblings' children.) Since settlements were largely though not entirely composed of relatives, most marriages took place between people in different localities, regardless of language. As Steward (1970:131) points out, the small size of Northern Paiute residential groups effectively enforced bilaterality and eliminated any tendencies toward unilineal group formation. Especially for higher-ranking people to the north and west, spouses of equal or higher rank were desired, which meant that village headmen might take spouses from some distance. Polygyny was practiced by men who could afford it, so wealthy people were often linked to a number of places. The levirate and sororate perpetuated alliances between families after the death of a spouse. Sibling exchange (either brother and sister-sister and brother, or brother and brother-sister and sister) was especially favored by Northern Paiutes and possibly by some eastern Sahaptins.

For people to the north, a marriage was legitimized by more or less equal exchanges of property. As noted in the previous section, exchanges of food and property between the families, continued over the years, were an important form of regional trade. Northern Paiute marriages also were marked by gift exchanges when the families could afford them, but the elaborate "marriage trades" of the area were typically Sahaptin and Chinookan. The regional networks created by intermarriage facilitated access to resources outside local areas, since usufruct rights in resource areas were extended to visiting relatives.

After a period of matrilocal residence, a married couple typically lived with or near the husband's parents and family, but this arrangement was modified by circumstances. To the north, a poor man might reside with his wife's family, and to the south-southeast, groups of siblings--especially brothers or male cousins (but often sisters too) formed the core of the local clusters. Ties created by intermarriage were used as the major means of shifting residence.

(2) Along the Columbia, winter villages generally consisted of perhaps nine or ten houses, each holding from one to possibly ten families. Occasional satellite hamlets might be fairly close by. The household ideally consisted of a man and his wife or wives, sons and their wives, children, otherwise unattached relatives, slaves, miscellaneous visitors, and hangers-on. After the death of the household head, a group of brothers might remain together, or some might start their own households or join others. The number of fires in the house

usually marked the number of nuclear family cores, but sometimes two families on opposite sides of the house shared a fire.

In spring, houses in the north were located directly on or near fishing sites, and were crowded with visiting relatives and others who came for the fishery. From spring through fall, individual families or groups of families moved out to temporary camps in root-digging grounds and to the mountains for hunting and berrying, with task groups of men or women going out on occasion. Some of the permanent villages might be nearly or entirely empty during these times. Groups on tributary streams probably spent more time in such activities than did those on the Columbia.

The much-discussed Paiute "band"--like the "tribe"--had little reality, being used to refer to food-named groups such as Juniper Deer Eaters, place-name groups, or followers of war leaders. A single group could have several different names, and one name could include several distinct groups (Fowler and Liljeblad 1986:436). For example, one group might have two or three food names, since individuals might differ in food preferences. Even one person could be a Juniper Deer Eater at one time and a Hunipui Eater at another, depending on the resources available in the area where he was living at the time (cf. Steward 1970:142). "Band" most appropriately refers to followers of a war leader, a type of group that flourished for only about thirty years (from 1840 to 1870), emerging only after the arrival of horses and in response to White incursions into traditional resource areas. The descendants of war leaders Wiawiwa, Oits, and Paulina (especially the first) are resident today on the Warm Springs Reservation, where Wiawiwa is said to have wintered at least one year at the mouth of the Warm Springs River and to have traded at Celilo (Harper, Hajda and K. French notes).

The Northern Paiute winter camp of some 50 intermarried people (Fowler and Liljeblad 1986) broke up in warmer weather into "camp clusters" (also called "local clusters" or "family clusters") of at most 20 people (Steward 1970) in one to five households (or "camps") containing individual families. The camp clusters--to judge by Steward's examples--consisted of groups of siblings or cousins (more often male) and their descendants. The associations among families, and especially among local clusters, could and did vary from year to year, but in areas with especially abundant resources the winter camps might be permanent enough to be called "villages."

(3) In all parts of the district, women collected plant foods and materials and prepared and preserved all foods, made textiles and clothing (including mats, baskets and bags, skins, furs, and robes) and cared for children, while men fished and hunted, made tools, utensils, houses, and weapons of wood, bone, or stone, and were warriors on occasion. Both sexes could be shamans, but only men were village leaders. Where slaves were owned (mainly in the north), they assisted with all the work, especially the more tedious.

Social distinctions by rank and heredity were especially salient along the Columbia, increasing as one went downriver. While Chinookan society is usually described as stratified, with classes consisting of "chiefly" families, the rich, the poor, and slaves (Spier and Sapir 1930:211-213; French 1961:364), only the distinction between slave and free was sharply drawn. Even when slaves were adopted or married, among both Sahaptins and Chinookans they and their children retained the stigma of slave origin. "Chiefly" families were distinguished from the merely rich by descent, but since classes were not endogamous all except slaves in a local group could probably trace some kinship. Wealth was thought to be open to all through gambling and shrewd trading, and a good marriage could increase a family's rank as a bad one might lower it.

The position of village "chief" in pre-reservation times is not entirely clear, since the authority of these individuals increased during the contact period, due to their focal role in the fur trade and in negotiations with Whites. Spier and Sapir (1930:213) describe for the Wishram a strong figure holding the power of life and death over his followers, making decisions which had to be obeyed. French (1961:362) is probably closer to the mark in characterizing a leader as one with influence rather than power: he represented the village to outsiders; he was not necessarily active, but his presence identified a situation as having judicial or executive character and legitimized group decisions. In general, the Chinookan or Sahaptin headmen ("chiefs," "principal men") were distinguished from commoners by leadership ability and generosity undergirded by wealth, influence, and respect. The Northern Paiute headmen had similar attributes, differing mainly in that the position was not hereditary. These heads of families, households, and villages were when possible the sons of former headmen, or failing that, a brother or more distant relative. In the event that more than one candidate was available, the other "principal men" chose the most suitable; they might refuse to support any headman regardless of descent whose attributes failed to qualify him to be a leader.

The headman in the north, like the shaman everywhere in the district, had a speaker, who on public occasions repeated the headman's or shaman's words loudly to the audience. His position, like that of task leaders, depended on ability, not inheritance. Task leaders included war leaders, hunting group leaders, and the northern "whipper" who instructed and disciplined village children. War leaders and warriors in the north (perhaps everywhere) had special spirit powers. Among Northern Paiute subsistence-group leaders, only antelope-hunt leaders had special power.

The shaman's position was also non-hereditary, resting on the possession of more (French 1961:366) or particularly distinctive and strong (Fowler and Liljeblad 1986; Spier and Sapir 1930:236-238;244-248) powers. They might specialize in different problems, depending on which powers they possessed (Fowler and Liljeblad 1986; Spier and Sapir 1930:244-248). Many people possessed powers enabling them to do at least minor curing (Hajda and K. French notes). Shamans sometimes acted as ritualists, as in cutting up the salmon at a First Salmon ceremony, but this was a minor part of their activities. Shamans might or might not also be headmen, but for most shamanism was a part-time occupation.

RELIGIOUS BELIEFS AND PRACTICES

CURING

Shamanistic curing followed a fairly standard format throughout the study area. The cure was performed before an audience; the shaman had a spokesman and one or more assistants. The shaman began the session with a smoke; while curing he sang his spirit song and might become possessed by his spirit. Among the riverine peoples, the audience sang and beat on long plank drums. Most diseases were believed to be caused by object intrusion; the corresponding cure was object removal, usually by sucking (Sahaptins used a sucking tube), sometimes by massage. The object was ejected, with blood, from the shaman's mouth and burned or dunked in a bowl or bucket of water. Shamans had their own paraphernalia, including feathers, a dew-claw rattle, a spirit pole, and occasionally amulets of stone or bone. They were paid for successful cures and might be blamed for unsuccessful ones. Soul loss was a secondary theory of disease causation, more prominent among Paiute.

LIFE CYCLE CEREMONIES

Life-cycle ceremonies were basically family affairs, but relatives living elsewhere may have been in attendance. Naming (not mentioned in the Northern Paiute literature, though practiced by them: Hajda and K. French notes) might take place separately and privately or at any ceremony, especially at a winter dance or when the end of mourning was observed. Ear-piercing was attended with much ceremony in the north, but none in the south. A boy's first kill and a girl's first gathering of roots or berries were the subjects of minor ceremonies throughout the study area. At a girl's first menstruation, all peoples in the study area isolated her in a special hut (also used for birthing), and subjected her to several tabus (such as the prohibition of touching her body and requirement of using a special wooden head scratcher). Paiute weddings lacked the back-and-forth giving and feasting of the north, and a similar lack of ritual behavior was connected with death and burial. Sahaptins and to a greater extent Chinookans practiced elaborate funeral and memorial celebrations. Some ceremonies were scheduled to coincide with a time when visitors might be expected to be present anyway, such as during fishing season.

Considerable variation existed in burial practices among the peoples of the Study Area. All peoples laid the body out on its back with the head to the west, and included grave goods which consisted of the deceased's personal effects. Paiute burial was otherwise very simple--the body was wrapped in a blanket and interred under rocks. The deceased's house was burned. Sahaptins usually wrapped their dead in tule mats and interred them in talus slopes (sometimes in wooden cists) marked by a mound and small stick. Chinookan burials were more elaborate. In the historic period cemeteries were limited to several "Memaloose" Islands in the Columbia River. Families owned burial houses, which Spier and Sapir (1930:271) describe as 10 by 6 ft. (3 by 2 m) structures of vertical planks with a shed roof over a shallow pit. Families employed special undertakers to prepare the corpse, which was wrapped in buckskin, lashed on a plank, and transported to the burial island. Early observers reported numerous grave images (Boyd n.d.). River peoples in general laid the body in state, held a post-funeral feast and property distribution, and sweated to remove contamination.

SPIRIT BELIEFS AND PRACTICES

The spirit quest followed a standard format throughout the Plateau (Benedict 1923), but was lacking among the Paiute, who received their visions in dreams. The quest usually took place around puberty, by both boys and girls. An elder usually supervised and trained the quester. The destination was always an abode of spirits--mountains and lakes are most frequently mentioned. The quest could last for a single night or much longer. The child underwent privations and was expected to perform a task such as building a cairn of rocks. The spirit (usually corresponding to an animal, sometimes to something inanimate) appeared in a vision or dream, bestowed a certain "power" (talent) on the quester, and taught him its song. The specifics of the quest were kept secret, but the owner made the identity of his spirit obvious at the winter dances by singing its song and pantomiming its actions.

The Winter Ceremonies, best described by Verne Ray (1939:102-122) are a Plateau hallmark. In basic outline they were similar to the Winter Ceremonies of the Northwest Coast and historically related to them. The usual elements of the Winter Spirit Dance, as it occurred among the Sahaptins and Upper Chinookans, included the following.

(1) The dances were held during the two coldest months (December and January, "60 days"). Performances took place in a large house with a prominent center pole. Individual dances lasted five days.

(2) New guardian spirits were "made obvious" to the audience. Novices, who had kept their guardian spirits secret since their quest, began to experience "spirit illness." At the Ceremonies, a shaman "diagnosed" the illness and then "gave" the novice his song. The novice then danced and sang.

(3) Other members of the audience now performed their own spirit songs and dances.

(4) Shamans, attended by spokesmen and assistants, sponsored the ceremonies. Besides initiating novices, the shaman performed various tricks, including handling hot rocks and swallowing fire or boiling water.

(5) Gifts were contributed by the shaman and all attendees, placed on an elevated horizontal board, and distributed to all in the final days of the ceremonies. Paraphernalia connected with Winter Ceremonies included a rectangular, slightly raised plank platform covered with elkskin on which the dancing took place; the "swinging pole" drum, hung from the roof and swung against the walls; and power-infused sticks, wands and images, usually of wood (summarized from Boyd n.d.).

HISTORICAL CHANGE

Most ethnographies of Pacific Northwest Indians, reflecting either the traditional ahistorical bias of the ethnographic present or the more recent assumption of ecological balance, have paid little attention to change. Considerable culture change is assumed for the contact period, but the possibility of its occurring earlier (in any analogous form) is rarely discussed.

In the past two decades a few articles written by archaeologists have addressed the issue of systemic change caused by technological innovations in the prehistoric upper Columbia drainage. The appearance of winter villages has been associated with the introduction of weirs (archaeologically marked by harpoon heads and salmon spear barbs) (Nelson 1973), an intensification of root gathering (Ames and Marshall 1980) (earth ovens may have made this possible), or a shift to concentration on the easily preserved fall chinook salmon run (Schalk 1983).

THE HORSE

Changes during the historic era may be analogous to prehistoric changes, as Nelson notes (1973:387). His example is the horse, a late addition to the cultural inventory, whose effects have been mentioned many times previously in this report. Nelson notes in particular the following.

(1) The effect of the horse on the diffusion "of goods and ideas" in the upper Columbia drainage. Exchange networks broadened, and new items entered the Plateau. Many subsequently appeared as grave goods. Local archaeological traditions with distinctive "projectile points, gambling pieces," and so forth gave way to "pan-Plateau" elements.

(2) Horses allowed transport of food over larger regions. Winter villages were no longer so dependent upon resources within a certain radius, and "became fewer and much larger."

(3) Horses, with a need for pasturage, place a premium on mobility. Immobile pit houses were replaced by movable dwellings, and bulky material goods gave way to those that were more easily carried.

Beyond these basics, we can note in more detail the impact of the horse on two other areas of culture as yet not discussed in this report: clothing and warfare.

Clothing is an item that changed rapidly after the establishment of Plains contacts (Gunther 1950). Among the pre-horse items were fur robes of various species, used during the winter, and fur caps. Paiute made twined fiber (juniper or sage bark) clothing. Both Paiute and Sahaptins had robes of woven rabbitskin strips. Women in all areas wore close fitting basketry caps. However, during the historic era, most clothing was made of buckskin. Women wore a long dress made of two deer hides; men a sleeveless buckskin (or other hide) shirt and leggings. Tanning (among the northern peoples) involved use of a rib or stone scraper to remove hair, a wooden trough for soaking (Wasco-Wishram), a stretching frame, and a hafted stone grainer. Clothing was decorated with horn and bone jinglers, tooth and shell applique, and porcupine quills. All peoples pierced their ears and wore earrings--dentalia among the wealth-conscious Chinookans and "anything" among the Paiute. Necklaces were made of claws or shells.

Warfare is a particularly difficult topic to deal with, as it was strongly influenced by Plains practices after the introduction of the horse facilitated communication with that region. Wasco-Wishram and Columbia Sahaptin warfare (at least according to early twentieth century informants) was quite similar. The usual purpose was revenge and restoration of social balance (lex talionis). Surprise attacks were most common, though Sahaptins participated in pitched battles, and Umatillas even counted coup. Both Chinookans and Sahaptins had war spirits in their cosmogonies, and (in the early contact period) recognized war chiefs. Warriors wore war paint and feathers in their hair. There was a dance of incitement and victory dance afterwards. Prisoners were taken and, significantly, both peoples scalped (definitely an introduced custom). Bows and arrows were used, and the river peoples also had small round hide shields. Chinookans used a "short stabbing lance" (probably the double-bladed knife). According to the element lists Paiutes had neither shields nor lances, and war was rare--a situation which changed dramatically after the Paiute acquired horses and guns in the mid-1800s.

A concomitant of the introduction of the horse and the Plains pattern of warfare was the extensive movement of populations in eastern Oregon (Ray et al. 1938). Diffusion of both was gradual, and the possession of the horse, plus some elements of developed warfare (and in a few cases, the gun) gave peoples who received them first a definite advantage over those who did not yet have them. In the 1820s Hudson's Bay traders noted that mounted Columbia River peoples were slave raiding among the as-yet-horseless Klamath. During this same time period, mounted groups of Columbia Sahaptins began exploiting traditional Paiute lands in Central Oregon, and Murdock's (1980:130) hypothesized displacement of the Molala from the Tygh Valley took place. By 1840 population movements in the north-central Oregon study area had ceased, and the action had moved south, where newly mounted and armed Klamaths were now raiding their horseless neighbors in the Pit River and upper Rogue valleys for slaves (summarized from Boyd n.d.). By mid-century, newly mounted Paiutes had coalesced into marauding bands under strong leaders, and were raiding both Indians and newly resident Whites throughout Eastern Oregon.

DISEASE AND DEPOPULATION

Several epidemics of infectious diseases are recorded for the study area following the initiation of White contact (Boyd 1985; Hunn 1990). A major smallpox epidemic dating between 1775-1781 is known for Chinookans and Nez Perce, and certainly affected the Sahaptins as well. A second, less destructive, smallpox epidemic followed in 1801, and in 1824-25 an unidentified "mortality" caused many deaths throughout the Columbia drainage. The "fever and ague" (probably malaria) epidemics of the early 1830s claimed lives as far upstream as the mouth of the John Day. Whooping cough, dysentery, and measles caused many deaths, particularly among children, along the middle Columbia in the 1840s. A final major outbreak of smallpox in 1853 preceded the Indian wars and removals of the mid-1850s. Introduced diseases were the major cause of post-contact population decline in the study area, and contributed to cultural change, most notable in the areas of settlement patterns, social organization, and religious beliefs and practices. If Campbell's recent (1989) hypothesis (based on archaeological evidence) of an epidemic in the region during the early 1500s is correct, analogous population decline and cultural disruptions may have occurred in earlier times as well.

NATIVISTIC RELIGIONS

A final example of historical change which merits discussion here, even though archaeological correlates might seem remote, is the rise of nativistic religions in the interior west during the mid-1800s. The peoples of the north-central Oregon study area had, as we have seen, a tradition of visions and dreams in which individuals received messages from spirits. Therefore, a cultural mechanism already was in place which facilitated the appearance of individuals with unique messages, or prophets. In times of unusual cultural stress, the messages these prophets brought provided ways of coping with new conditions, and were adopted into the cultural inventory. In the 1800s important prophets included Wovoka, a (Nevada) Paiute, who founded the Ghost Dance Religion; Smohalla (a Sahaptin) who was largely responsible for the coalescence of elements into what would eventually become the Washaat Religion, and Jake Hunt (a Klickitat), founder of the Feather Religion (DuBois 1938; Mooney 1896; Trafzer and Beach 1985). Each of these new religions was "syncretistic," combining native and Christian beliefs and practices into a new configuration. All three share many common elements; songs appear to be most specific to each.

Of the three, the Washaat Religion became the most widely used for public ceremonies in the north-central Oregon study area. The elements of this new religion came together gradually. A belief in prophecy and a form of communal dancing are aboriginal (Spier 1935). A belief in a high god appears to date to the second or third decade of the 1800s, and Sunday dancing, large communal dance houses, a dance/flagpole, and handbells can all be assigned with some degree of confidence to the decade of the 1830s, a time of considerable disease-caused population loss and the first appearance of missionaries (Boyd n.d.). In the 1860s Smohalla tied these and other skeins into a coherent whole with its own belief system and ritual. Smohalla was the individual most responsible for institutionalizing the present communal first fruits ceremonies celebrated by most southern Plateau peoples. On the Paiute model, these were probably originally simple family affairs. (Among Northern Paiutes, dances and prayers, with gambling, footraces, and general fun-making, preceded such group food-getting efforts as antelope or rabbit drives, and fall, winter, and spring fish runs. A fall festival preceded the pine-nut harvest.) The most important of these First Fruits celebrations are the First Greens Ceremony, Root Feast, First Salmon Ceremony, and Huckleberry Feast (Hunn 1990; Trafzer and Beach 1985). Areas containing resources celebrated by first fruit ceremonies are found are considered sacred in the Washaat religion. Other new items of material culture strongly associated with the new religions include the hand drum and wing dress.

Given the local cultural basis for this proliferation of prophets and new religions in the 1800s, it might be suspected that this was not a new phenomenon, and that parallel processes had taken place in earlier periods of cultural stress in the study area (see W. Strong [1945] for one possible example).

PREHISTORY

The ethnographic human lifeways discussed in the preceding section afford a model against which to compare and contrast archaeological data on earlier cultures in the study area. This model is far from perfect, however, since (1) the ethnographic data do not describe concretely the archaeological manifestations of the contact-period culture, and (2) the available information on early nineteenth-century peoples is incomplete, and biased largely toward The Dalles and lower Deschutes River areas at the expense the much larger remainder of the study area. Another fundamental problem with the ethnographic picture as an archaeological model is its lack of time depth. Because earlier cultures may have differed significantly and qualitatively from the recent aboriginal pattern, archaeological interpretations must consider culture as an adaptive system in order to avoid forcing reconstructions into an artificial and restrictive ethnographic framework. This concern for adaptive patterns and underlying causes makes archaeology an explanatory science rather than simply descriptive historiography, and allows an examination of cultural development in a particular region, such as north-central Oregon, to contribute to the worldwide quest to understand the evolution of the human condition.

The discussion of prehistory in the Prineville District, offered below, is presented as synthesis and interpretation, not as recapitulation of archaeological projects conducted since the previous overview (Toepel et al. 1980). In fact, many projects and studies completed since that time are not mentioned at all, not because they make no contribution, but because reference to them does not serve the present purpose. Instead, the approach here is to consider a group of basic topics relating to adaptive and land use patterns, and addressed by existing data for definable time periods and geographic regions. Put more explicitly, the broad question to be considered is as follows: What evidence for human occupation exists for a given period, and what does it tell us about resources and areas exploited, the adaptive strategy and settlement pattern used, and the archaeological manifestations we might expect to find? Comparing existing data against such a question should highlight the extent of our knowledge and ignorance about prehistory, and provide a basis for future research designs.

Presented in order are four gross and widely accepted cultural periods: (1) Paleo-Indian, represented by fluted points and believed to date from about 12,000 to 10,500 B.P.; (2) Early Archaic, marked by large, stemmed lanceolate as well as foliate points, and thought to fit between about 10,500 and 7000 B.P.; (3) Middle Archaic, associated with broad-necked, notched, triangular points temporally placed usually between about 7000 and 2000 B.P.; and (4) Late Archaic, indicated by smaller narrow-necked, notched, triangular points believed to mark the introduction of the bow-and-arrow by 2000 B.P., and continuing to the time of interhemispheric culture contact. These periods are used only for the sake of convenience, and are not offered as formally defined temporal or cultural units, since, for the most part, cultural chronology in the study area is understood and documented to a rudimentary degree only.

Table 3.6 is a list of reports that are basic to an understanding of prehistory in the study area, and are the primary sources of information used for the present discussion. These reports are grouped according to the geographic subdivisions adopted for this summary: the Columbia River, the lower and upper John Day River drainages, the lower and upper

Table 3.6. Key Reports on the Prehistory of the Prineville District.

COLUMBIA RIVER:

Butler 1959
Cole 1954
Cressman and Cole 1954
Cressman et al. 1960
Dumond and Minor 1983
Pettigrew 1981
Schalk 1980, 1987
Strong et al. 1930
Wilde et al. 1983
Wilke et al. 1983

John Day Dam Reservoir Reports:

Cole 1963, 1964, 1965, 1966, 1967, 1968, 1969
Cole and Cressman 1959, 1960, 1961
Cole and Leonhardy 1964
Cole and Newman 1958
Cressman and Cole 1962
Shiner 1950

LOWER JOHN DAY RIVER DRAINAGE:

Camp Hancock Reports:
- Atherton and Houck 1976
- Gannon 1968, 1970, 1972a, 1972b, 1975a, 1975b, 1978, 1979
- Houck and Atherton 1977
- Johnson 1972
- Knapp 1979
- Mazany 1980
- Riggs 1967, 1969
- Smith and Gannon 1973

Cressman 1950
Crowley Thomas 1986
Krieger 1938
Polk 1976

UPPER JOHN DAY RIVER DRAINAGE:

Armitage and Burge 1986
Clark and Matz 1989
Jenkins 1988
Zilverberg 1983

LOWER DESCHUTES RIVER DRAINAGE:

Cole 1967, 1969
Cressman 1963
Hartmann 1985
Hibbs et al. 1976
Ross 1963
Toepel and Beckham 1981
Toepel et al. 1983

UPPER DESCHUTES RIVER DRAINAGE:

Cole 1977
Cressman 1937, 1948
Davis and Scott 1986
Gibson 1989
Gibson and Pettigrew 1989
Ice 1962
Lyman et al. 1983
McFarland 1989
Minor and Toepel 1984
Minor et al. 1988
Pettigrew and Spear 1984
Scott 1986a
Scott et al. 1986
Silvermoon 1989
Stuemke 1986, 1989

CROOKED RIVER DRAINAGE:

Armitage 1983
Fagan and Sage 1974
Minor et al. 1987
Pettigrew 1982
Toepel and Beckham 1981
Toepel et al. 1983

GREAT BASIN:

Mack 1975
Toepel and Beckham 1978

Deschutes River drainages, the Crooked River drainage, and the Great Basin. The work by Wilde et al. (1983), conducted on the lowermost John Day River, is included in the Columbia River group because of its proximity and relevance to the Columbia River context. The division between the upper and lower Deschutes River is taken to be the mouth of the Crooked River, and that between the upper and lower John Day River is placed at the mouth of Bridge Creek southeast of Clarno. The area designated "Great Basin" here is the region south of the Crooked River drainage, on the southern margin of the Prineville District.

PALEO-INDIAN (12,000-10,500 B.P.)

Evidence for Paleo-Indian occupation in the Prineville District is very scant, consisting only of two or three fluted (possibly Clovis) points found in the Columbia River vicinity. One of these, referenced by Toepel et al. (1980:83), was reportedly collected by amateurs on the middle Columbia River (Strong 1969). The other has not been noted previously by archaeologists in the literature, but is illustrated by Strong et al. (1930:Plate 12) as Specimen 2-12135 (University of California Museum of Anthropology). This specimen resembles the Clovis type closely in terms of its size and shape, but the photograph does not show unambiguous fluting. Strong et al. (1930), however, conducted their research and wrote their report before the Clovis type was recognized (Sellards 1952), so the point deserves further inspection. The third point considered here is a clearly fluted point reported by Mack (1975:Plate 8a) for the Glass Buttes area (in the Great Basin), and resembling the Clovis type, but possessing distinct and uncharacteristic shoulders. This point might be a Clovis specimen subsequently modified to fit the Windust template (see discussion of Windust points, below) during Early Archaic times. The associated site 35LK326, is located on a rise alongside a small ephemeral lake south of Glass Buttes, in a context similar to that of other sites that have produced fluted points in southeastern Oregon (Pettigrew 1984; Spencer and Schmidt 1989; Willig et al. 1988).

Even if direct evidence for Paleo-Indian occupation were absent from north-central Oregon, we would postulate such a stage because of the evidence found widespread throughout North America. This evidence has been summarized recently by Kelly and Todd (1988), who propose an adaptive model to account for the patterns recognized for sites with fluted points. Such sites tend to be relatively small, low in density and assemblage diversity, yield raw materials derived often from sources at great distances, and suggest short-term and not often-repeated use of particular locations. Lithic raw material tends to occur in the form of large bifaces instead of cores or nodules. The Kelly and Todd model, which is an elaboration of ideas suggested by many investigators, holds that Paleo-Indian peoples existed in small bands with family-level sociocultural integration, and that they focused their subsistence attention on herds of large mammals (especially now-extinct forms of elephant and bison). This focus was successful for a time because, at the end of the Pleistocene, during a transition from ice-age times to more moderate climatic conditions, these mammals were a reliable and well understood resource over large regions. Dependence on local plants and smaller mammals would have required detailed knowledge of the locations and annual cycles of such biota within delimited localities. Clovis bands, then, took advantage of their hunting skills to pursue and harvest large herds of mammals that were available year-round in many regions whose environment and biotic character otherwise might have been very different. This foraging lifeway required frequent travels to maintain contact with the quarry or to find new herds to follow, and resulted in a small-band social structure, low population density, relatively infrequent re-use of particular base camps and other kinds of sites (such as butchering localities and raw material sources), and reliance upon large bifaces both as primary tools and as mobile stores of lithic raw material.

If this model has validity for north-central Oregon, then the presently sparse body of evidence for Paleo-Indian occupation is understandable, and we might be able to predict where and in what form evidence for this period might be found. Nowhere in North America is the Paleo-Indian Stage abundantly represented, but areas where the Kelly and Todd model suggests it should be found are those where large herd mammals might have been most plentiful. The behavior of mammoths and extinct bison is poorly understood at best, but the obvious suggestion is to look in grasslands and forest margins. In the Prineville District, late Pleistocene grasslands (for which, unfortunately, direct paleoenvironmental evidence is sadly lacking) might have been abundant on the Deschutes-Umatilla Plateau (where wheat presently is a major crop), in the broad flats of Central Oregon near Madras, Redmond, and Bend, and on the vast High Desert south of the Maury Mountains. Forest margins suitable for large herds might have existed on the perimeters of the Blue Mountains and Newberry Caldera, and on the eastern slope of the Cascade Range. Discovery of Paleo-Indian sites, however, depends upon other factors as well, particularly site-formation processes such as erosion and alluviation. Inhibiting our ability to find such sites, especially in Central Oregon, is the mantle of volcanic deposits (summarized by Davis and Scott 1986), particularly ash from the Mt. Mazama eruption, that covers vast areas where Paleo-Indian sites could lie buried. In the Great Basin zone, however, as suggested by the results presented by Mack (1975), ancient surfaces and localities holding traces of Paleo-Indian occupation might be readily identifiable.

EARLY ARCHAIC (10,500-7000 B.P.)

Columbia River

Evidence for human use of the study area immediately following the Paleo-Indian period is decidedly more plentiful, but offers only slight improvement in our understanding of the lifeways represented. The best data for the Early Archaic comes from sites along the

Columbia River, particularly Five Mile Rapids Site (35WS8) at The Dalles and the Wildcat Canyon Site (35GM9) east of the mouth of the John Day River. The Five Mile Rapids Site, also known as the Roadcut Site (Cole 1954; Cressman and Cole 1954; Cressman et al. 1960), is famous for the richness of its early cultural deposits (described by Toepel et al. 1980:90-93), which include a wide variety of flaked stone tools, bolas stones, bone and antler tools, as well as a wide diversity of faunal remains with over 125,000 salmon vertebrae (Cressman et al. 1960:67), radiocarbon-dated between 9785 and 7875 B.P.

This evidence is widely thought to show "...that a riverine adaptation based on salmon fishing had begun at least 10,000 years ago at The Dalles" (Toepel et al. 1980:91), but reconsideration of the data suggests that such a conclusion is premature. The interpretations by Cressman et al. (1960) do not take into account sampling bias caused by the very limited horizontal extent of the excavations and the fact that only a single site is represented. They also ignore taphonomic and geomorphological factors. While the huge numbers of salmon vertebrae found at the site in the same deposits with a rich cultural assemblage easily evoke an image of specialized salmon fishers, good reasons exist to look for alternative explanations. As pointed out by Schalk (1987:10-19), the mass of salmon bones is so much at variance with the normally limited fish remains found at later Columbia Plateau sites where salmon fishing unquestionably was of major importance that taphonomic factors might be a better explanation. The faunal remains in the same deposits include a wide variety of scavengers, both mammalian and avian, which, together with the backwater environment proposed by Cressman et al. (1960), "suggest the possibility that some proportion of the salmon remains from this site were introduced as the result of non-human agencies" (Schalk 1987:10-19). Further, though little doubt exists that fish were a major attraction to human use of the Five Mile Rapids area at that early time, human cultures in the vicinity are not thereby shown to have developed a riverine adaptation dependent largely on salmon. Even if such early specialization could be shown to have existed at The Dalles, its relevance to other riverine areas where salmon are not as easily caught still is not demonstrated. A likely scenario, as discussed below, is that intensification of salmon fishing, and the development of riverside villages as the focus of the adaptive strategy and the settlement system, came much later in north-central Oregon and on the Columbia Plateau in general.

The Wildcat Canyon Site (Dumond and Minor 1983) offers some opportunity to examine these and other ideas about Early Archaic human adaptation on the Columbia River. This site contains a substantial and well described body of data for pre-Mazama (before 7000 B.P.) occupation (referred to as the "Philippi Phase," beginning about 9000 B.P. and thus largely overlapping the "Early" period at the Five Mile Rapids Site) on the south bank of the river just east of the mouth of the John Day River. These data include lithic as well as bone and antler tools, and "occasional milling stones and manos" (Dumond and Minor 1983:156), along with a small faunal assemblage dominated by artiodactyla (deer, sheep, or pronghorn antelope). However, no fish bones and no specialized fishing tools, and no evidence of constructed houses, were found; thus, the authors suggest that the uncovered remains were "those of one or a series of hunting camps, in which supplemental collection was done" (Dumond and Minor 1983:146). The evidence does not at all resemble that witnessed at the Five Mile Rapids Site, and does not support the notion (nor yet remove the possibility) of Early Archaic adaptation based on salmon fishing along the middle Columbia River. Instead, the site may best be seen either as a part of a more generalized adaptive system or as a hunting-and-gathering constituent of a logistical system focused elsewhere.

Deschutes and Crooked Rivers

Elsewhere in the study area, Early Archaic data exist but are not nearly as completely investigated or described. Fagan and Sage (1974) mention two cave sites, one on the lower Crooked River and the other nearby on the Deschutes River, where Windust points were found by relic collectors in the lower levels. Similar points, described by Rice (1972) on the lower Snake River, date between 7000 and 11,000 B.P. Little more is known of these sites and the context of the early points, but the evidence at least shows Early Archaic use of Central Oregon, and indicates that sites of this period exist to inform us about human land use. Similarly tantalizing evidence recently has come to light at the Eagle Crest Site (Gibson and Pettigrew 1989) alongside the Deschutes River near Redmond, where a point resembling the Windust type was recovered from the surface. Confirming Early Archaic use of Central Oregon is a radiocarbon date of nearly 8000 B.P. from a rockshelter (35JE41) on the Deschutes River in the Round Butte Dam Reservoir area (Ross 1963).

At the extreme upper end of the Deschutes River drainage, at Odell Lake near the crest of the Cascade Range, Cressman (1948) reported a small collection of artifacts recovered beneath Mazama ash during construction activities. This and subsequent investigation (Stuemke 1986) has demonstrated Early Archaic use of this high-elevation locality, but tells us little about just what activities were undertaken or how the site fits into the settlement system of the period. Comparable evidence comes in the form of another small collection of artifacts accidentally uncovered below Mazama ash on the upper Deschutes River at Wikiup Damsite No. 1 (Cressman 1937).

Great Basin

In the Great Basin portion of the Prineville District, the Glass Buttes survey remains the main source of information on site-distribution patterns. Of the 85 sites found, Mack (1975) offers age estimates, based on cross-dating of projectile points, for 35. Of these 35 sites, 9 (26%) are considered to date wholly or partially to the Early Archaic. Five (56%) of these nine sites are associated with ephemeral lakes, and the remaining four with intermittent streams. This association of Early Archaic sites with the former margins of lakes and marshes is now a familiar pattern in the northern Great Basin (Bedwell 1973; Pettigrew 1984; Willig et al. 1988), and the pattern has prompted the hypothesis (Pettigrew 1984; Pettigrew and Lebow 1989) that the Western Pluvial Lakes Tradition (coined by Bedwell [1973] to encompass the lake-oriented Early Archaic of the Great Basin) began when

> . . . the large herd animals (especially the mammoth, but possibly including the horse and large bison) had been decimated, and it became necessary to focus on a more reliable and diverse set of resources, including a variety of plants and animals on the still-wet bottomlands. Base camps were located on the margins of lakes and marshes, and seasonal hunting and gathering zones were limited mostly to lowland areas, since ecozones still had not risen to substantially higher elevations and food sources in the lowlands, including big game, waterfowl, and vegetable foods, were dependable and abundant. Use of upland areas . . . was slight. Human populations in the lowlands . . . appear to have been quite substantial, probably as much as any later period. The abandonment of this lifeway may have occurred as early as 8000 B.P. . . . if the lakes and marshes upon which the human populations and their food sources depended disappeared at that time, as one might infer from Mehringer's (1985) data. The rate of decline of such bodies of water likely would have depended on factors such as latitude, elevation, characteristics of their drainage basins, and their size, and some lakes and marshes probably would have lasted longer than others (Pettigrew and Lebow 1989:84-85).

This model may apply as well to the Great Basin portion of the Prineville District, though at present the database there is not sufficiently developed for a satisfactory test.

Discussion

For north-central Oregon as a whole, however, characterizing the Early Archaic in terms of adaptive strategy is much more difficult because of the sparseness of the data, and proposed models must rest on a very infirm foundation. Information on this period from surrounding regions can offer some help, but does not reduce the need for caution. Such contributory data are available from the Malheur Lake-South Fork Malheur River area, the Blue Mountains, and areas east and north of the Prineville District on the Columbia Plateau. Of the 130 prehistoric sites recorded by Chatters (1986) in his survey of the corridor from Malheur Lake through the upper reaches of the South Fork Malheur River, 34 provided some chronological information. Of these 34 sites, 9 (26%) were assignable to the Western Pluvial Lakes Tradition, and all were located either near the ancient shore of Malheur Lake or along the now-extinct river that drained the lake at that time into the Malheur River. These sites contained lithic assemblages only, generally lacked milling stones and features, and were interpreted as "residence camps of a mobile, foraging population" (Chatters 1986:71).

The Pilcher Creek Site (35UN147) (Brauner 1985), located just east of the John Day River drainage area in the Blue Mountains at an elevation of 1200 m (4000 ft.), evidences at least seasonal use of these uplands, apparently for hunting, during the period between about 11,000 and 7,000 B.P. As is common with sites of this time, no grinding tools were recovered to suggest the use of plant foods. The place of this site in the settlement system of the time as yet is undetermined.

Early Archaic sites on the Columbia Plateau east and north of the Prineville District are not uncommon, but still have not generated a satisfying model of the adaptive pattern. Excavations in 1982 at the Umatilla Bridge Site (35UM58), though not yet formally reported, yielded important data relating to riverside activities of the time. Discovered during earlier testing prior to highway construction (Pettigrew 1983), the site was shown at that time to consist of an unusual assemblage of lithic artifacts and well preserved faunal remains in a deep, alluvial, stratified context on the south bank of the Columbia River. Cobble tools were a surprisingly high proportion of the lithic assemblage, and no bifacially flaked tools were found. Also unusual were the high proportion of coarse-grained stone and low percentage of cryptocrystalline silica among the lithic debitage. The 1982 excavations (under the overall direction of one of the present authors, Richard Pettigrew) expanded upon the testing data, and showed that much of the site occupation occurred during the millennium prior to the Mt. Mazama eruption (ca. 7000 B.P.). The assemblage characteristics displayed by the test excavations were confirmed, including the good preservation and wide diversity of the faunal remains, which included substantial representations of small mammals (especially lagomorphs), varieties of fish (including salmonids), shellfish, and large mammals. These and other characteristics suggest use of the site as a summer camp, possibly sited to take advantage of fish runs at nearby McNary Rapids, and clearly not particularly oriented toward hunting big game, but not restricted to fish-related functions.

Farther upstream, on the lower Snake River, sites associated with the Windust Phase (Leonhardy and Rice 1970; Rice 1972), which includes that part of the Early Archaic up to about 8000 B.P., are fairly well documented, and show a hunting orientation, despite their riverside locations. As described by Rice (1972), the three principal Windust Phase sites, Windust Caves (45FR46), Marmes Rockshelter (45FR50), and Granite Point (45WT41), produced flaked lithic assemblages without specialized fishing tools. Only Marmes Rockshelter yielded grinding tools (manos and metates). Faunal remains were dominated by large mammalian forms, and none of the very few fish bones found were salmonids.

Also associated with the Windust Phase, but located in a non-riverine setting, albeit alongside a perennial stream in the channeled scablands of the Columbia Basin, the Lind Coulee Site (45GR97) (Daugherty 1956; Irwin and Moody 1978) offers perhaps the best view of human activities yet obtained from an Early Archaic site in the areas surrounding the Prineville District. Interpreted as a seasonal base camp utilized at least during the early spring and possibly later in the year as well, the site dates to a limited period around 8700 B.P. (Irwin and Moody 1978:257). The large artifact collection includes both lithic and bone tools, including crescents, serrated bone points, and eyed needles. The few grinding tools found suggest use for preparing pigment rather than for food processing. Faunal remains are very diverse, and range from lagomorphs to bison, including deer, but bison and elk clearly dominate and illustrate a major focus of site occupation. Fish remains are absent entirely, but waterfowl are present, including duck and goose. As with other Early Archaic sites, the place of the Lind Coulee Site in the settlement system is not clear, because so few sites of the period are known.

Altogether, the picture of the Early Archaic in and surrounding the Prineville District shows no clear adaptive focus or settlement organization, and this picture may suggest that such a lack of focus actually was a characteristic of the period. If the model proposed by Kelly and Todd (1988) for Paleo-Indians and by Pettigrew and Lebow (1989) for the Early Archaic of the northern Great Basin are correct, the end of the Paleo-Indian period was coincident with a new adaptive problem: the demise of the large mammalian herds made dependence upon them untenable and required expansion of the subsistence base to include resources (still largely animals) whose exploitation demanded more detailed knowledge of local habits, availability, and distributional patterns. Foraging territories therefore became more areally restricted, and settlement systems more logistically organized, though not to the extent witnessed in later millennia. Bands remained small and integrated at the family level, but at least in places with resource abundance population densities rose dramatically, as a consequence of reduced demands for travel, improved efficiency of resource extraction, and a favorably moist, mild, and biotically productive environment. Subsistence remained dependent largely upon faunal resources, with a bias toward large mammals where they were abundant, but including also smaller mammals and waterfowl. Fish resources generally were of limited importance, but increased use of fish may be indicated after 8000 B.P., as suggested by Leonhardy and Rice (1970:9) for the Cascade Phase on the lower Snake River, and by recent data from the Umatilla Bridge Site (discussed above). A relative lack of food preservation technology, as suggested by Schalk (1980:29; 1987:10-20) may have limited population densities in areas where wintertime food availability was restricted. As a corollary, site placement, much more than in later periods, may have been governed by the seasonal location of animal food resources.

The model proposed here has implications for the expected distribution and character of Early Archaic sites in the Prineville District, though the level of specificity unfortunately must be limited by our knowledge of the biotic conditions of the period. Greatest densities of sites should be located where abundances of faunal resources were high during all seasons of the year. Such possibly was the case for the Great Basin portion of the District, where herds of large mammals, in tandem with at least seasonally abundant waterfowl, might have maintained relatively substantial human populations. Similarly, low-elevation areas along the Columbia River and its tributaries may have offered some degree of year-round abundance through the combination of fish, waterfowl, small mammals, and large mammals. Areas without ponds and marshes, salmon streams, or areas attractive to large mammals for grazing would have supported only very limited human populations, and might have been used very little. Such could be said of most upland areas, though concentrations of special resources, such as game herds, might have encouraged seasonal use of particular localities. Tool assemblages at sites throughout the District are not expected to vary greatly in their character, reflecting the limited specialization of the technology and the simple settlement system. For example, food-grinding and specialized fishing tools should be absent, or nearly so. Thus, functional distinctiveness of sites should be low except perhaps in terms of faunal remains. Evidence of houses should be difficult to find, since habitations probably were light and easily dismantled to allow frequent moves by small foraging groups. The way of life generally indicated by this model appears to have been remarkably different from the ethnographic pattern with which we are familiar.

MIDDLE ARCHAIC (7000-2000 B.P.)

The Middle Archaic in north-central Oregon, as elsewhere in the Pacific Northwest, is a time when human occupation becomes much more obvious in the archaeological record, and perhaps the most important adaptive changes took place. Sites of this period are present practically everywhere, and display attributes, individually and as a group, distinctly setting them apart from those of the previous period.

Schalk (1980:29-36; 1987:10-23) points out that the Middle Archaic witnessed the most important and archaeologically visible cultural change in the prehistory of the Columbia Plateau: the appearance of the "winter village pattern." Though definition of this pattern might vary between researchers of the area, its primary characteristics relate to the appearance of clusters of pithouse dwellings. Pithouses are thought by many to mark the beginning of the ethnographically documented pattern of culture on the Plateau, though this interpretation turns out to be overly simplistic. In fact, the emergence of the pithouse (a technological feature) and the village (a sociological phenomenon), while both essential to describing cultural evolution on the Plateau, may have occurred at different times, and neither necessarily betokens the cultural pattern as described ethnographically. Understanding the developments that led to the ethnographic culture appears to require examination of the archaeological record on pithouses and villages, as well as evidence for the subsistence practices, including the collection of storable plant (roots and seeds) and animal (usually salmon) foods. Though begun as a study of cultural evolution on the Columbia Plateau, this review has equal value for the understanding of cultural change on the high plateau to the south.

Columbia River

Famous for its indications of salmon fishing in the Early Archaic, The Dalles area is much less useful for study of subsequent cultural patterns. As summarized by Pettigrew (1981:128-130), most of the evidence presented by Cressman et al. (1960) and Cole (1954) for the time following the "Early" stage probably postdates 2000 B.P., leaving a large gap in the record from the Five Mile Rapids and Big Eddy sites. Also, provenience data for important artifact classes are absent or difficult to interpret. For example, manos and metates are described by Cressman et al. (1960:57), but no provenience data are given for those classes in the report. In the Five Mile Rapids Site, the period following 6000 B.P., above the "Hardpan," is lumped together in the report, disallowing what could be some useful temporal distinctions.

Also frustrating in this regard are the sites on the Washington side of the river reported by Butler (1959). These include the Congdon and Maybe sites, both of which appear to contain Middle Archaic components. The usefulness of these sites for present purposes appears limited to their illustration of the remarkable richness and diversity of some Middle Archaic assemblages at The Dalles, including ornaments and stone sculpture along with a great variety of flaked and ground stone, bone, and antler tools.

Middle Archaic occupation of the Wildcat Canyon Site (35GM9) (Dumond and Minor 1983) occurred in two defined phases. The first, the Canyon Phase (6500 to 5000 B.P.), is interpreted to represent a seasonal hunting and gathering camp, rather little different from the Early Archaic use of the site, but including "some milling stones and manos" (Dumond and Minor 1983:157). Following a hiatus in site use, the Wildcat Phase (2500-1000 B.P.) represents the most intense period of site use. The first subphase of the Wildcat Phase (2500-2000 B.P.) falls late in the Middle Archaic, is interpreted as an intensively occupied summer camp, and comes just before the first construction of pithouses in the subsequent subphase (2000-1500 B.P.). Introduced with the Wildcat Phase are notched netsinkers (indicative of intensive fishing in the Columbia River) and pestles (probably used in hopper mortars to grind vegetable foods such as roots).

John Day River

Closely related to the Wildcat Canyon Site is the complex of 19 sites recorded on the nearby John Day River by Wilde et al. (1983), and belonging to the last 6000 years of prehistory. Three sites produced evidence of Middle Archaic occupation, including one, the Morris Site (35GM91), that subsequently was excavated by Schalk (1987). Though some suggestion of Early Archaic occupation exists, the main period of use of the site followed 4935 B.P., was most intense after 3000 B.P., and markedly fell off after 2000 B.P. No specialized fishing tools were found, though fish remains, including salmonids, were plentiful, perhaps obtained by dip-netting or trapping fish at the nearby John Day River Narrows. Pestles and "milling stones" both were found. Analysis of flotation samples remarkably included traces of edible roots, a rare direct confirmation of the use of such food. Similarly important was the identification as rootcake (probably biscuitroot) of a charcoal sample radiometrically dated to 3100 B.P.

Farther upstream in the John Day River Canyon is a group of 76 prehistoric sites discovered by Bureau of Land Management survey (Polk 1976) between Clarno and Cottonwood Bridge. A large proportion (62%) of these sites possess housepits, ranging from one to 17 per site, though most had six or fewer, and nearly half had three or fewer. The total count of housepits was 230, of which at least some probably are of Middle Archaic age, though no direct dating on them has been done. Manos and metates were found at most housepit sites. Sites of many other kinds were found as well, including talus pits, rock piles, rock alignments, rock art, rockshelters, and lithic scatters. Clearly this canyon was the locus of intensive human activity during the Middle and Late Archaic, but much remains to be learned about temporal and functional patterns.

Some insight into the archaeological record for the John Day River Canyon area can be obtained by examination of the reports on archaeological investigations by the staff of the Oregon Museum of Science and Industry's Camp Hancock, beginning in the 1960s (Atherton and Houck 1976; Gannon 1968, 1970, 1972a, 1972b, 1975a, 1975b, 1978, 1979; Houck and Atherton 1977; Johnson 1972; Knapp 1979; Mazany 1980; Riggs 1967, 1969; Smith and Gannon 1973). From 1967 through 1980 approximately 55 sites were identified by student teams from Camp Hancock, of which 13 (24%) contain housepits. Other site types include rockshelters, rock art, artifact scatters, rock features, and quarries. Most sites are within the Pine Creek drainage, tributary to the John Day River, and none are in the John Day Canyon. One of the most remarkable facts to be learned from these data is that habitation sites with housepits are frequent in tributary canyons, often quite remote from the John Day Canyon itself. Housepit sites in tributary canyons vary in size, but many apparently are small, suggesting occupation by small family groups, and could not be described appropriately as "villages." Thus far, radiometric dates and projectile points from the only housepit site reported in the Pine Creek drainage, Jones Canyon 2 (35WH21) (Gannon 1972a, 1975a,b, 1978; Houck and Atherton 1977; Johnson 1972), place it after the Middle Archaic. Two rockshelters, however, Cove Creek 2 (35WH7) (Gannon 1968, 1970, 1972b) and Pentecost Shelter (35WH2) (Riggs 1969) have produced broad-necked projectile points suggesting Middle Archaic occupation, and the Cove Creek 2 site has yielded two radiocarbon dates on a cache of atlatl dart shafts between 2200 and 2400 B.P. The likelihood seems great that the intensive occupation of the Pine Creek area shown by the Camp Hancock data had its origins in the Middle Archaic, but this remains to be investigated.

Archaeological exploration farther south, in the upper John Day River drainage, has been relatively limited, though both Krieger (1938) and Cressman (1950) visited the area long ago. Evidence of Middle Archaic use of the area comes from the Blue Mountains south of the John Day River. In the Wind Creek project, the Ochoco National Forest (Armitage and Burge 1986) excavated five sites with radiocarbon dates ranging from 4030 to 210 B.P. and yielding both broad- and narrow-necked projectile points. The sites are believed to have functioned as hunting camps, an interpretation supported at two sites by faunal remains of large mammals. Though their place in the settlement system as yet is undetermined, they likely served as seasonal outposts for people who wintered in the canyons of the John Day River and its tributaries.

A project conducted in 1988 by the BLM in the Johnson Heights area, an upland zone north of the Ochoco Mountains and south of the John Day River, examined eight sites, all of them apparently seasonal camps (Clark and Matz 1989). Systematic surface collection and subsurface testing produced collections dominated by flaked lithic debris, but four of the sites contained both grinding tools (including a pestle, hopper mortar bases, and metates) and bone fragments. Projectile point cross-dating from this group of sites indicates that prehistoric use of the vicinity took place during the Middle and Late Archaic periods. Interestingly, eight of the 10 obsidian specimens submitted for sourcing failed to match known sources, suggesting that obsidian type variability in the region is greater than might have been thought.

Deschutes River

In the area of the lower Deschutes River, again many sites are known from survey, but rather little information exists from more intensive investigation. The principal survey in the area is that of Hibbs et al. (1976), who covered the Deschutes River Canyon from Warm Springs Bridge to Macks Canyon, recording along the way 135 Native American sites, of which 37 (27%) contained housepits. Most of these had between one and six housepits, but two much larger sites possessed 29 and 31 housepits, respectively. Other site types recorded include rockshelters, habitation sites without housepits, shell middens, quarries, artifact scatters, talus depressions, cairns, pictographs, and petroglyphs. the chronology of occupation in the canyon is mostly unknown, but Middle Archaic occupation of at least some of the sites seems probable.

That some of the housepit sites in the canyon are Middle Archaic appears supported by data from the Macks Canyon Site (35SH23) (Cole 1967, 1969), where numerous housepits were recorded in several seasons of excavation. Though the radiocarbon dates reported are all later than 2000 B.P., the projectile points from the lower occupation levels (including pithouse floors) suggest late Middle Archaic age. Pestles and hopper mortar bases were common, and faunal remains were dominated by freshwater mollusks, bighorn sheep, and deer. Fish remains were infrequent.

Farther upstream, near the confluence of the Deschutes and Crooked rivers, Cressman (1963) and Ross (1963) describe survey and excavations in the Round Butte Dam Reservoir. Many of the 48 sites, including two rockshelters (35JE1 and 35JE2) radiometrically dated to 2675 and 2650 B.P., respectively, fall within the Middle Archaic, and most of the rest are Late Archaic. Most of the sites were rockshelters, seven contained grinding tools, especially hopper mortar bases and pestles, eight sites yielded mussel shell, two possessed fish remains, and at one (35JE2) six fishhooks were recovered. No housepits were found at any of the sites.

Recent survey of forest lands on the Warm Springs Indian Reservation has provided previously unavailable information about site distributions on the eastern flank of the Cascade Range west of the lower Deschutes River (Hartmann 1985). The results include 90 prehistoric isolates and 53 prehistoric sites, of which most (75%) are lithic scatters. Other site types present include rockshelters, cambium-stripped trees, housepit sites, shell middens, quarries, rock cairns, talus pits, and rock art. Projectile points found appear to cover the entire Middle and Late Archaic periods, though associations of types with particular sites unfortunately are not given. Apparently, however, widespread use of the landscape appeared during the Middle Archaic.

Evidence of human use of the upper Deschutes River drainage during the Middle Archaic is widespread, though as yet the settlement system(s) remain poorly understood. Habitations with housepits are notably absent, and where the local population spent their winters is not clear, nor whether a centrally-based logistical system such as that apparent farther downstream ever existed. Some site locational tendencies can be delineated, along with patterns of increasing land use intensity, but relatively little variability in site function has been demonstrated.

Survey of the open and dry terrain south of Redmond (Lyman et al. 1983) has shown that exploitation of the area essentially began during the Middle Archaic, and that hunting of animals probably was the main land use. No grinding tools, and no large concentrations of prehistoric cultural debris, were found. These results contrast notably with the apparently greater site densities found by others near watercourses.

A good example of the latter pattern is presented by Scott (1986a), who conducted a survey of the Deschutes River from Bend to the Deschutes/Jefferson County line (29 river miles [46 km]), discovering 71 prehistoric sites in the process, including 2 pictograph sites, 7 rockshelters, and 62 lithic scatters. Both Middle and Late Archaic periods are represented, though the former more than the latter. Rockshelters tend to contain mussel shell, and no grinding tools were noted.

A rockshelter (the Peninsula 1 Site [35JE53]) excavated on the Deschutes River by amateurs and described by Stuemke (1989) is similar to those described by Scott (1986a). Projectile points and radiocarbon dates indicate both Middle and Late Archaic occupation, but the earlier period saw more intensive use of the site and of riverine resources, as indicated by mussel shell, a bone fishhook and part of a composite harpoon. A hopper mortar base is illustrated (Stuemke 1989:3), but the provenience is not indicated, and faunal remains are not described.

South of Bend, just west of and above the Deschutes River canyon in the vicinity of the Cascade Lakes Highway, several phases of research (Minor et al. 1988; Pettigrew and Spear 1984) have illustrated the distribution and pattern of a complex of 13 sites that appear to reflect the activities of prehistoric hunters. The site assemblages are dominated by flaked lithic debris, including projectile points of types indicating use of the area in both the Middle and Late Archaic periods. Faunal debris (identified from two sites) is predominantly from medium and large mammals, and three of the sites produced grinding stones, including two hopper mortar bases and two more generalized grinding slabs. Interpretations offered by Pettigrew and Spear (1984:30) for two (35DS56 and 35DS57) of the sites appear to have relevance for the whole group, which

> . . . would fit into a settlement strategy in which base camps or villages were located in a nearby location such as the lowland zone alongside the Deschutes River and short-term hunting camps were used in the forested uplands to the west. These sites do not offer good evidence for seasonality. If [these sites] are typical, hunting camps within a mile or two of the Deschutes River were used for only short stays, and most butchery and cooking was done at larger nearby sites. No doubt hunting camps were only one part of a multi-faceted settlement system that included fishing and the gathering of vegetable products as well. This system and the nature of the various kinds of sites that represent it can be outlined only after a detailed comparison of sites and their assemblages in a regional context.

A candidate for the category of riverside base camp is the Lava Island Rockshelter (35DS86) (Minor and Toepel 1984), on the Deschutes River just below the Cascade Lakes Highway sites. This site yielded a large assemblage of flaked lithic tools, including a cache of lanceolate bifaces cross-dated by Minor and Toepel (1984) to the Early Archaic, though the three radiocarbon dates obtained all fall within the past 2200 years. Also present were points clearly relating to the Middle and Late Archaic, along with faunal remains dominated by deer but including also smaller mammals, a single fish bone, and a single fragment of freshwater mollusk. Pine nuts recovered might relate to human use of the site also, but no grinding stones were found. Subsequent obsidian hydration rind measurement of the biface cache (Scott et al. 1986) indicates an age much later than proposed by Minor and Toepel (1984), and much more in line with the radiocarbon dates, probably in the Middle Archaic and possibly even in the Late Archaic range.

Still farther south, in the pine forest alongside a lava flow north of Newberry Caldera, the Lava Butte Site (35DS33) (Ice 1962) evidences intensive use of the open, dry terrain several miles from the Deschutes River. In that respect the site is similar to the Cascade Lakes Highway sites, but the Lava Butte Site is much more substantial in its size, depth, and data productivity. The projectile points indicate both Middle and Late Archaic occupation, and the huge collection of flaked lithics is complemented by six metates, five pestles, and 13 hopper mortar bases. Except for a bone awl, no faunal remains are reported.

McFarland (1989) reports excavations at two sites (the Dusty Mink Site, 35DS502, and the Grayling Springs Site, 35DS381) on Fall River near the southern limit of the Deschutes River drainage. The former site appears to fit within the Late Archaic, while the latter evidences both Middle and Late Archaic occupation. The assemblages, much like those from the Cascade Lakes Highway sites, are composed mostly of huge collections of lithic debitage and relatively small numbers of flaked tools. No grinding stones or food remains were found. Surveys reported by McFarland (1989) along Fall River, and by Gibson (1989), McFarland and Davis (1985), and Silvermoon (1989) along the nearby Deschutes and Little Deschutes rivers, suggest that sites of this general character (though some variability might be expected) are frequent on the leading edges of alluvial terraces that parallel these streams. At least some of these sites apparently are of Middle Archaic age. This interpretation receives support from the investigation of site 35DS39 at Sunriver (Cole 1977), where the lithic assemblage contained only Middle Archaic point types.

Crooked River

In the Crooked River drainage only a relatively small amount of intensive investigation has taken place, though several substantial surveys are on record. Middle Archaic occupation at site 35CR20 on Mill Creek east of Prineville has been shown by excavation and analysis of the stratified cultural deposits (Pettigrew 1982). Containing Middle Archaic points in association with a radiocarbon date of 2850 B.P., the lower component at the site consisted of a dense concentration of flaked lithic debris, features, and faunal remains. Animals represented were mammals of all sizes, and birds. This lower component is interpreted as a base camp from which hunting and associated activities were undertaken.

Other information on Middle Archaic use of the Crooked River drainage comes from survey reports. For example, although Toepel and Beckham (1981) found relatively few sites in the Crook County segment of the Buckley-Summer Lake Transmission Line corridor, two of them (35CR72 and 35CR81), both shallow, open lithic scatters, yielded projectile points, all of

Middle Archaic types. Armitage (1983), in his extensive review of site data from Ochoco National Forest surveys, shows that 21 (58%) of the 36 sites with classifiable projectile points could be assigned at least in part to the Middle Archaic, while 18 (50%) of the sites dated at least partly to the Late Archaic. Eight percent of the sites overall possessed grinding slabs, but this percentage varied greatly by forest district, from 1% on the Big Summit District to 18% on the Prineville District. This pattern may relate to elevation (and thus plant associations), since elevational fluctuations also were notable: below 1195 m (3920 ft.) grinding slabs are present in 6% of the sites, between 1195 m (3920 ft.) and 1500 m (4920 ft.) they are found in only about 2% of the sites, and above 1500 m (4920 ft.) they occur in 12% of the sites. Almost the reverse is true for projectile points, which clearly are far more frequent in the lowest than in the other two intervals. Armitage (1983) presents a model to account for such patterns, involving seasonal movements from lower to upper elevations and back. However, a lack of intensive investigation of the sites prevents validation of the proposal.

More recent examination of data from the Ochoco National Forest was carried out by Minor et al. (1987:151-176), who summarized key information regarding chronology and site function. Their summary showed that, as measured by projectile points, the Middle and Late Archaic were roughly equivalent in their land use intensity, but that Middle Archaic use was predominant in the Maury Mountains and Late Archaic use in the Ochoco Mountains. (An "Early Period," not necessarily associated with the Early Archaic as used here, also was included in their tabulation.) In the Crooked River National Grassland (which includes portions of the lower Deschutes River, upper Deschutes River, and Crooked River areas as defined here), Late Archaic points were much more frequent than those of the Middle Archaic. In all areas lithic scatters overwhelmingly outnumbered other site types. Of the forest areas within the Crooked River drainage, only in the Ochoco Mountains were rock circles and house depressions recorded (at 12 sites altogether in Table 6-1), though their absence in the other areas could well be the result of much smaller samples of sites. Grinding tools were found in all areas, the majority of them classified as manos, metates and grinding slabs. Pestles and bowl mortars occured in the Ochoco and Maury mountains, but not in the Crooked River National Grassland. "Grinding slabs" and "metates," however, can easily have functioned in some cases as hopper mortar bases, as is suggested by sites in the lower John Day River area where pestles are associated with flat slabs rather than the expected mortars (Gannon 1975b; Mazany 1980).

Great Basin

In the Great Basin portion of the Prineville District, 21 Middle Archaic sites, as indicated by projectile points, are known from the Glass Buttes survey (Mack 1975), constituting 60% of the 35 sites with temporally diagnostic points. By this measure, intensity of land use in the area appears to have increased markedly at some time during the Middle Archaic, though this pattern may at least partly be an artifact of the longer time span represented by the period. Unfortunately, the survey data tell us very little about the function of these sites.

Discussion

This review of the Middle Archaic in north-central Oregon highlights the remarkable increase in the visibility of the human presence associated with the period. In every area inspected, Middle Archaic occupation is a prominent part of the record, and appears to mark the beginning of an adaptive pattern that continued in its basic characteristics until historic times. We cannot say with confidence, of course, that important adaptive changes did not take place after 2000 B.P., but the time span of the Middle Archaic clearly was a turning point in regional cultural evolution. Just how and why this change occurred cannot yet be demonstrated, but some possibilities already are apparent.

On the Columbia Plateau, Schalk (1987) proposes that housepit settlements occurred first at about 5000 B.P. on the steppe-forest margin of the Columbia Basin, because that zone was where optimal plant and game resources combined with salmon availability to create an ideal setting for people prepared to make use of these three key types of resources. The Schalk model has promise, but can benefit from further elaboration in the context of our earlier discussion about the adaptive pattern of the Early Archaic. If it is true that Early Archaic peoples were basically foragers, lacking substantial capabilities for food storage, then the innovation of food storage techniques connected with such seasonally plentiful resources as salmon and roots (Ames and Marshall 1980) could have revolutionized their lifeway, eventually allowing greatly increased population densities in areas where year-round food abundance did not occur.

This consideration links well with the model of culture change proposed by Pettigrew and Lebow (1989:84-89) for the northern Great Basin, where the "Transitional Archaic" adaptive mode during the period 7000-5000 B.P. ". . . is thought to have been an attempt to find ways to adapt to dramatically changed environmental conditions (the loss of the last large herd animals and the substantial reduction of lowland wetland resources) following the onset of mid-Holocene desiccation" (Pettigrew and Lebow 1989:85). These changed environmental conditions might have pertained outside of the Great Basin, including on the Columbia Plateau, as is suggested by the Silvies Plateau paleoenvironmental study of Reid et al. (1989). According to the Pettigrew and Lebow model, environmental constraints stimulated the development of techniques to hunt solitary game mammals with notched projectile points, and to invest in the labor-intensive and expanded use of dryland seeds and roots, which were processed most efficiently with grinding stones. At the same time, where salmon were available (and their availability might have declined during periods of drought), increased fishing would have been very adaptive, especially in conjunction with the development of effecting drying or smoking techniques. The adoption of labor-intensive food collection techniques, combined with new harvesting and processing technology, created a new economy in which stored foods allowed people to structure their foraging habits and take up a logistical system with a central home base, even in areas that formerly were marginal because of seasonal scarcity.

By 5000 B.P., the time proposed by Schalk (1987) for the first pithouse settlements, the climate had begun to ameliorate, and the newly developed adaptive pattern (the "Full Archaic" as defined by Pettigrew and Lebow 1989) was in a position to take advantage of the new (albeit seasonal) abundance. If Schalk is correct about the location of these first pithouses, then the first such settlements in north-central Oregon occurred on the northern flank of the Ochoco Mountains, or on the eastern base of the Cascade Range near the lower Deschutes River. Such settlements might have been located near these upland zones in the Deschutes and John Day canyons, where winters are relatively mild. The first sites with pithouses would have been small, accommodating a single or very small groups of extended families, and dependent upon resources directly obtainable by these residents.

In fact, the earliest pithouse sites in the interior Pacific Northwest do occur around 5000 B.P. or slightly thereafter (Ames and Marshall 1980; Lohse and Sammons-Lohse 1986). A site which may typify the theoretical pattern is 45OK11, in north-central Washington at the base of the Okanogan Highlands alongside the Columbia River. The location of the site, within close range of upland as well as riverine resources, fits Schalk's criteria well. Here a small group of housepits, bracketed by radiometric dates between 5200 and 4200 B.P., was found associated with profuse evidence of a broad economic base "geared toward hunting, collecting, and fishing, with fishing evidently a secondary activity" (Lohse and Sammons-Lohse 1986:118). Mussel shell, suggesting an important dietary supplement, was abundant. Milling stones were numerous, and included pestles and hopper mortar bases. Fish remains were present in the housepits, but no specialized fishing tools were recovered. Sites of this general character probably exist elsewhere in comparable locations within the Prineville District, as central bases of a logistical settlement system that included seasonal hunting and gathering sites in important resource zones, especially where game animals and roots were abundant.

For the time following the initial establishment of housepit sites, the Schalk (1987) hypothesis holds that the success of the new adaptation required intensification of subsistence activities in response to population increase. Thus, by 3000 B.P. salmon fishing had become a much more important part of the economy, and habitation sites began to expand geographically toward areas with substantial fall runs, particularly along the arid banks of the middle Columbia River. In north-central Oregon, the lower reaches of the Deschutes and John Day rivers would apply also. This intensification process likely continued after 2000 B.P. This part of the model may explain why the intensity of occupation along the lower John Day and Deschutes rivers appears to increase so dramatically late in the Middle Archaic and the Late Archaic periods.

For the southern half of the Prineville District the combined model presented here offers some hope of interpreting the existing data and predicting what will be found eventually. Presently, south of the major salmon areas no unambiguous winter habitation sites are recorded for any period, though many apparently seasonal hunting and gathering camps are found. Plenty of evidence exists for the hunting of large mammals, and some for plant gathering and fishing. Intensity of regional use increased here in the Middle Archaic as in other places, suggesting that a logistical, central-based settlement system was adopted. It seems likely, then, that winter habitation sites will be discovered, but no compelling reason, such as the availability of fall runs of salmon, exists to expect them to be alongside major rivers, though some could be located there. Instead, they may be in sheltered lowland situations with access to winter congregations of deer or sheep as well as to important root and seed gathering grounds. Given the dispersed nature of the resource base, such sites are likely to be small and dispersed over the landscape. They may exist even in unsuspected places, such as near lava tube caves in Central Oregon that could have been both sources of water and natural "refrigerators" for storing fresh meat. Wherever these sites may be located, the establishment of a logistical adaptive system with emphasis on storable foods appears to be the best explanation for the dramatic increase in Middle Archaic use of areas where seasonal scarcity apparently prevented substantial use during the Early Archaic.

LATE ARCHAIC (after 2000 B.P.)

For the most part, the period following 2000 B.P. in the Prineville District saw cultural continuity with the latter part of the Middle Archaic, and no fundamental shifts in cultural adaptation are apparent. As might be expected for the most recent period, the archaeological record for the Late Archaic is bountiful. Cultural change almost certainly took place, as suggested by the Schalk (1987) intensification model, but did not necessarily follow the same course in all areas. Further, archaeological investigation has varied geographically in its nature and completeness, leaving a variously distinct picture of local prehistory. For this review of the Late Archaic period, we shall follow the same geographical path as used above in examining what is known of adaptive patterns.

Columbia River

Late Archaic use of The Dalles area clearly was very intensive, though the recent archaeological record has received much less play than that of the Early Archaic. As pointed out by Pettigrew (1981), a variety of sites fall within the Late Archaic, including Wakemap Mound (45KL26) (Caldwell 1956; Strong et al. 1930); Five Mile Rapids (35WS8) (Cole 1954; Cressman et al. 1960); Big Eddy (35WS2) (Cole 1954; Cressman et al. 1960); site 35WS5 (Shiner 1953); and the Friendly Village Site (Cole 1974). In their early report on Wakemap Mound, Strong et al. (1930:33) describe 19 house depressions, which remain the earliest known features of that kind for The Dalles locality, though it is virtually certain that the local population used fixed dwellings before the Late Archaic. Also of interest is "Site 18" (45KL221), near the mouth of the Deschutes River, reported by Strong et al. (1930:29-33), to contain 132 "circular pits." Though no temporal indicators are given, the likelihood of a Late Archaic age for this large village seems great (Schalk 1987:2-5).

Upstream on the middle Columbia River, the bulk of the evidence, including many housepit villages, for human use in the John Day Reservoir area relates to the Late Archaic (Pettigrew 1981:131-133). Best known of these is the Wildcat Canyon Site (Dumond and Minor 1983), where the most intensive use was in the period 2000-1000 B.P., during the Wildcat Phase, when the site was a winter village with pithouses. Following 1000 B.P. the site apparently became a summertime camp only. Many of the nearby sites identified on the John Day River (Wilde et al. 1983) no doubt were used during the same time (many produced Late Archaic projectile points), largely as seasonal extraction sites. These include the Morris Site

(35GM91), reported by Schalk (1987) and described above, which was most intensively used before 2000 B.P. but continued to be occupied in the Late Archaic.

John Day River

The large groups of sites recorded farther upstream in the John Day River Canyon (Polk 1976) and in tributary canyons such as Pine Creek (see the Camp Hancock reports listed above) and Muddy Creek (Crowley Thomas 1986) certainly affiliate largely with the Late Archaic, and in fact may exemplify the intensification proposed by Schalk (1987) for the Columbia Plateau. All of the dated sites reported by the Camp Hancock authors have yielded Late Archaic radiometric ages. The most fully reported of these is Indian Canyon 2 (35WH13) (Gannon 1975b, 1978; Knapp 1979; Mazany 1980), an open site without housepits. The site contained pestles and possibly 110 hopper mortar "slabs" along with more than 70 oven features, bones of deer and smaller mammals, and mussel shell. These remains occurred at the upper end of a tributary canyon far removed from the John Day River. In the Muddy Creek drainage, five housepit sites were located adjacent to minor intermittent streams; test excavations revealed living floors or hearths, and yielded Late Archaic radiometric dates (Crowley Thomas 1986). The Late Archaic picture in the Pine Creek and Muddy Creek drainages, and probably in the entire network of canyons tributary to the lower John Day River, is one of small communities spaced throughout the area, intensively using salmon, freshwater shellfish, deer and other large mammals, and roots.

Our knowledge of Late Archaic use of the upper John Day River drainage suffers from the same lack of investigation noted above for the Middle Archaic. The Wind Creek project on the Ochoco National Forest (Armitage and Burge 1986), and the BLM Johnson Heights project (Clark and Matz 1989), discussed above, show Late Archaic as well as Middle Archaic use of the uplands south of the John Day River. Some further information on the Late Archaic comes from excavations at Mitchell Cave (Jenkins 1988), also in the northern foothills of the Ochoco Mountains. This site apparently was used as a seasonal base camp (largely during the Late Archaic, though a small number of Middle Archaic points were found as well) by hunting and gathering parties, as indicated by the assemblage of flaked lithic tools, grinding tools including a metate or hopper mortar base, a mano, and a pestle, and a faunal collection dominated by large and medium mammals. Of interest also is the presence of river otter bones and mussel shells at a location some distance from substantial permanent streams. Mitchell Cave in its gross characteristics appears to resemble seasonal camps reported in the Pine Creek drainage, discussed above.

Deschutes River

The sites found by Hibbs et al. (1976) along the lower Deschutes River probably date largely to the Late Archaic, and many may resemble the Mack's Canyon Site (35SH23) reported by Cole (1967, 1969), which has housepits apparently of both Middle and Late Archaic age. Similarly, many of the sites described by Ross (1963) in the Round Butte Dam Reservoir clearly are Late Archaic (many of them rock shelters), though curiously no housepit sites and rather few open sites were noted. We should assume also that the site distribution pattern found on the Warm Springs Indian Reservation by Hartmann (1985) at least partly reflects land use during the Late Archaic period. Clearly, however, much investigation of the lower Deschutes River drainage is required before a better understanding of changes in land use patterns in this key area is realized.

In the upper Deschutes River drainage as well, detailed information about changing land use patterns is lacking, so that for the most part distinguishing between the Middle and Late Archaic adaptation is severely hampered. Few investigations have revealed distinct Late Archaic patterns as compared to the Middle Archaic. A small exception is the Peninsula 1 Site (35JE53) (Stuemke 1989), where the intensity of use, along with the emphasis on riverine resources, declined during the Late Archaic.

Information on changing land use in the Crooked River drainage is perhaps more complete, thanks mostly to the efforts of the Ochoco National Forest (Minor et al. 1987). As mentioned above, intensity of land use appears to have declined in the Maury Mountains, but increased in the Ochoco Mountains, during the Late Archaic. In the Crooked River National Grassland, the Late Archaic appears to mark a dramatic increase in use, although the sample size of projectile points on which this generalization rests is small.

Great Basin

In what still is the most representative sampling of the Great Basin portion of the Prineville District so far, the Glass Buttes survey (Mack 1975) appears to document much reduced use of that region during the Late Archaic. A count shows that only four (11%) of the 35 sites with temporally diagnostic projectile points can be placed at least partially in the Late Archaic, remarkably less than the figure of 60% obtained for the Middle Archaic. Thus, land use in the Late Archaic appears to decline to less than 20% of the intensity recorded for the Middle Archaic. This curious fact may reflect a climatic change, a decline in effective moisture following a moist interval. The onset of this drier climate occurred at 2050 B.P. in the Diamond Pond (south of Malheur Lake) pollen sequence (Wigand 1987), and at about 1900 B.P. at Craddock Meadow on the Silvies Plateau north of Malheur Lake (Reid et al. 1989). A reduction in effective moisture in the Glass Buttes survey area could have depleted the faunal and botanical resources that had attracted more intensive use during the Middle Archaic.

Discussion

Land use patterns in north-central Oregon in the Late Archaic seem to represent a continuation of the adaptive structure seen in the latter part of the Middle Archaic. The intensification proposal of Schalk (1987) may help to explain the peak in land use seen in the middle Columbia and possibly the lower John Day River areas, but appears to have little utility in the Great Basin portion of the Prineville District. Present data cannot address the issue adequately in the remainder of the study area, though clearly intensification can be appropriate only for resources (an excellent example of which is salmon) whose yield can be increased through greater effort or improved techniques. Future research may be needed to determine to what extent deer (or other large mammals) and roots fall into that category.

As detailed above, land use patterns in north-central Oregon have undergone remarkable changes during the time of human habitation. If the interpretations and models discussed here are close to correct, then these changes have happened in concert with similar changes throughout western North America, and have bearing on human cultural evolution in general. Continued examination of archaeological data in this framework should yield sizable gains in the interpretive powers of regional investigators.

HISTORY

The historic period usually is conceived to begin in about 1805 in north-central Oregon with the arrival of the Lewis and Clark Expedition. However, forces derivative from European activity along the coast, and to the south, in New Mexico, were felt earlier in the form of trade goods and new markets. How far back in time might these effects have been noticed at The Dalles, the regional trade center? One can say that it would have been before 1775, for in that year the Spanish crews of the Santiago and Sonora saw new European goods in the hands of the Quinaults on the Washington Coast (Galvin 1964:41f). The same was true of James Cook's men at Nootka in 1778 (Samwell 1967:1103).

But, apart from wrecks, there were no documented landings of European vessels on the coast before the Sonora anchorage at Nootka in 1774. This is an unresolved mystery. When dealing with recent archaeological deposits, one must keep these facts in mind. The overland contacts with New Mexican and Californian Spanish are even more difficult to document before the early 19th century (Rich et al. 1950:147).

It is best to move beyond mutually-exclusive time or cultural blocks and deal instead in overlapping phases, which permit more realism. So we will start the historic period, viewed in terms of material goods, in contagious diseases, and with the stimulation of trade in such important commodities as furs and slaves, in the year 1775. The period of direct European contact along the Columbia River above The Dalles began at 1805, so far as we are able to document it. Below The Dalles the date was much earlier, 1792, the year of the American and British entries into the Columbia River.

In the interior of north-central Oregon the earliest European visit that is well attested is that of Ogden's brigade of 1825 (Rich et al. 1950). There very easily could have been earlier entries by members of the Pacific Fur Company or the North West Company. An inscription believed by some to have been made in 1813 has been found near Bend, which could attest to such entries (Clark 1976).

Following the advent of land-based fur-trading companies in 1811, there was regular movement by traders and introduction of trade goods along the Columbia River corridor. During the Northwest Company period of dominance (1814-23), headquarters were at Fort George (Astoria); the closest interior posts were on the upper Columbia among Salishan peoples. Fort Nez Perces at the mouth of the Walla Walla River was established in 1818; with the advent of the Hudson's Bay Company in 1824, downstream headquarters shifted to Fort Vancouver. In the study area itself, temporary posts were established in 1829-30 on Mill Creek (by Americans) and at Big Eddy (by the Hudson's Bay Company) (Meinig 1968; Voorhis 1930).

Although many elements of Christianity preceded them, missionaries did not visit the study area before 1835. Missions were established at Waiilatpu on the Walla Walla in 1837 and at Wascopam (The Dalles) in mid-1838. The Wascopam Circuit extended from The Cascades to Wyam. During the decade of missionary dominance (1837-47), non-coercive acculturation of the Native American population of the study area advanced rapidly, and set the stage for the major cultural disruptions of the 1850s (Boyd n.d.).

Central Oregon presented just about the most rugged obstacles encountered by the emigrants along the entire Oregon Trail, whether by the most commonly used northern version running between the pass through the Blue Mountains to the Cascades or by the Central Oregon routes used by the Meek parties of 1845, or those of later years (Clark and Tiller 1966; Menefee and Tiller 1976-79). An important approach to the Barlow Road was from Mud Springs near Moro, south to Olney's Ferry near Sherar's Bridge (Conyers 1906; Due and French 1979). Between Grass Valley and the Deschutes River this route probably traversed quite a bit of what is still public domain.

Another fact not so well known is that large numbers of emigrants in covered wagon trains entered Central Oregon from California in the 1860s, mostly, but not entirely, using the Yreka Road (e.g., Rand 1981). That also crosses much BLM land. Then there were emigrants in wagons, often pushing large herds of cattle and pigs, who entered Central Oregon in that same decade from the Willamette Valley, coming by McKenzie and Santiam passes. The Dalles-Canyon City-Boise road, built and used, like the others, before being designated an official military wagon road, also saw thousands of emigrants entering Central Oregon, not only from The Dalles, but also from Boise. It is not always remembered that many overland emigrants from the east used this road in the 1860s in preference to the route through the Grande Ronde Valley (Nelson and Onstad 1965).

Until the 1860s, this overland trailing left little imprint on the country except to destroy the forage and game in strips through the country. Indians were rarely seen, except for those who made part of their living helping the emigrants at the crossing of the Deschutes River, or who, like the Cayuse on the flanks of the Blue Mountains, sold vegetables, cattle and horses to the emigrants. If just a few thousand emigrants had come after the first opening of the wagon road in 1841, a syncretic culture, already begun in the Pacific Northwest, might have flourished and evolved into something wonderfully exotic. But the emigrants kept coming in larger and larger numbers, and the native population grew increasingly apprehensive, then sullen, suspicious, and then violent.

The first group of Indian wars began in 1848 with the Cayuse War, the answer of Oregon volunteer units from the Willamette Valley to the massacre of the Whitmans and their dependents in late 1847. In this war at least two large battles were fought in north-central Oregon, one near the crossing of the Deschutes River, the other at Sand Hollows near Boardman (Gilliam n.d.; Victor 1894). The Cayuse War lasted just a few months, but tensions remained considerable for years after, to flare up again in the Yakima War of 1855-56. The

Indian war now became almost universal throughout the Pacific Northwest. Apart from the activity along the Columbia River, by both volunteer and regular units, there were incursions by troops south of the Columbia River into north-central Oregon, searching for hostiles, and they found some excitement. Although the subject of a dissertation (Bischoff 1950) and many popular treatments, the Yakima War, like the Cayuse, has not received much professional attention beyond the work of Bischoff.

There was a lull in 1857, then a renewed eruption in 1858, centered in eastern Washington. The defeat of the Indians by Col. Wright and his troops pacified the Indian tribes of the Columbia Plateau, including the native inhabitants of the northern two-thirds of the present Prineville BLM district. The Northern Paiute began their long war of resistance (the Snake War) the very next year, 1859, and continued it until their surrender in 1868. So we can readily speak of a 21-year period of sporadic Indian wars, 1848-1868, that affected the present Prineville District directly. Only one episode took place beyond that, the Bannock War of 1878, that briefly touched the eastern side of the present district, until the grim final battle northwest of Ukiah (Brimlow 1938).

We have now jumped ahead of ourselves, for 1868 is really the second of the two great watershed dates in the nineteenth century in Central Oregon; it came seven years after the other, which we briefly alluded to earlier--1861. In that year the flood of gold miners and those who supported or profited from them began in Central Oregon. The Euro-American activity was confined to the mines, to the military posts placed to protect them and the lines of communication, and to the ranches located near the mines or along the lines of communication. For those years during the Snake Wars, white settlement was entirely insular or linear in nature.

After the surrender of 1868, white settlement spread out to all zones that appeared to have the rainfall to support farming or livestock husbandry, to virtually the entire area of north-central Oregon, except for the higher elevations in the mountains (Chance n.d.). The upper limit of settlement in the last thirty years of the last century seems to have been at a little above 4,500 ft. (1370 m). Above that elevation winters were too much of a problem. However, summer transhumance was entirely possible to the very summits of all mountains except for the major volcanoes in the Cascades. Higher altitude use of grazing lands before 1900 is something of a question that needs study--in northern Harney County it seems to have been very common during the summer (Simpson 1987).

Cattle grazing spread outward from its small beginnings in the John Day Valley. Large-scale capitalist ranching arrived in Central Oregon in the 1870s, though there had been cattle herding by both Native Americans and Euro-Americans near the Columbia River in the 1850s (Oliphant 1968:75-114). Sheep herding also started in the 1870s, but it did not become large-scale until near the end of the century, following the severe winters at the end of the 1880s (Simpson 1987). That helped to occasion the famous conflicts between sheepherders and cattlemen, a story that has not been brought into the full light of day--it is still a sensitive issue. This bloodletting seems to have eclipsed an earlier period of vigilantism in Central Oregon that centered in the early 1880s (Oliphant 1968:219).

Far more important, however, was the immigration and founding of towns and hamlets in north-central Oregon from 1882 to the late 1880s, caused by the completion of the railroad first to Portland in 1881-82 and then the transcontinental link of 1883 (Shaver et al. 1905; Villard 1944). The middle 1880s are the third major watershed that must be reckoned with in understanding settlement and historical archaeology.

Irrigation began in earnest in Central Oregon in the first decade of our century, partly a consequence of the Carey Act (Brogan 1964; Hatton 1978). A new wave of homesteading in the John Day River country started around 1902 (Bruesch and Bruesch n.d.). Whether that was related to the Carey Act or not we are unsure. The railroad had been built along the Columbia River by 1882 (Villard 1944:87), but it was not until 1911 that the Oregon Trunk line brought rail service to Central Oregon to take advantage of the new irrigation and timber empires. The railroad stimulated the establishment of new towns and irrigation projects in the Deschutes Valley (Deschutes Valley Tribune 1911). Few decades in our national history have exhibited the energy and innovation of the first decade of this century. It is the fourth in the series of historical watersheds throughout the Pacific Northwest. But, even though there were large increases in population in the region at this time (Johansen 1967:621), the counties of north-central Oregon do not seem to have increased very much in that way, an interesting problem for research (Toepel, Willingham and Minor 1980, population tables).

Yet another land settlement episode seems to have begun about 1912 and continued well into the First World War (Allen 1987; BLM archaeological site forms), an interesting parallel to the initial Euro-American settlement in Central Oregon during the Civil War. Also in the early part of the century were the large land withdrawals made to create forest reserves, partly a reaction to land grabs and uncontrolled grazing. The birth of the conservation movement in the beginning of the century, coupled with the fact that large parts of north-central Oregon remained in federal trust, meant that the free-wheeling nature of local behavior in the 19th century gave way to a much more subdued program, albeit gradually. It seems now to be a well-regulated landscape, a feature that will eventually itself become a topic of historical inquiry.

At about midway between the two world wars the last agricultural expansion into the mountains and deserts of Central Oregon began to fail and then contract, a response partly to a drier climate, perhaps also because of the failure of the cash economy in the Great Depression which made it difficult for farmers and ranchers located far from population centers. Places that had seen thriving communities of homesteaders up and down the creeks and valleys reverted again to the silent wilderness, though a revival of mining slowed the slide in some areas. People who view things from the agrarian perspective might think that we had passed the peak of our civilization. This expansion and contraction of human settlement in Central Oregon is one of the major issues for historical inquiry, one that relates to both the historical sites that have come to light, and to the Bureau of Land Management's central mission.

HISTORICAL PROCESSES

We know something about the factors that have helped to determine where people have decided to settle, or work. We frequently see the correlates of the natural world discussed, such factors as weather, altitude, presence of water, presence of suitable soils, timber, and, in the case of Oregon, the notably low frequencies of communicable diseases and insect pests. The latter were important considerations to the overland emigrants coming from the upper south and the lower midwest (Unruh 1979). The mildness of the winters also was important, though eastern Oregon does not enjoy the mild weather found west of the Cascades. All of these aspects of the natural world were important, but people in historic times, and in Oregon that means post-Industrial Revolution times, had a great many techniques, tools, and ideologies that equipped them to enter environments that were not obviously good ones to settle in and farm.

Our economy was sufficiently advanced, that by the time Central Oregon was settled during the Civil War, transportation was rapid enough that a considerable specialization was possible in food and industrial production, so that people could venture into the high deserts and cold mountains and plan on raising just grain, or sheep, or cattle, without fear of starving. For by the 1860s it was possible to purchase canned and dried goods in Central Oregon that had been put up in England, China, and on the east coast of the United States (Auburn Ledger 1968). At the same time, it was possible then, but more especially in the 1870s and 1880s, to raise wheat next to the Columbia River for export to Europe, even though grain was not an extremely valuable commodity. Human agricultural and village settlement began to pick up in eastern Oregon and Washington only after the transcontinental railroad link was made in 1883 (Shaver et al. 1905). Thereafter, national economic considerations would play a very great part in determining where and why people settled in Central Oregon. The point here is that the factors affecting settlement in eastern Oregon were world-wide in their points of origin, and a parochial view of cause and effect would be hopelessly inadequate to any kind of understanding.

To pursue this line further, we must bring into discussion the various land settlement laws and customs of the United States which were probably much more important than natural factors in determining the frequency, density, and duration of settlements. Land entries were possible under the Preemption acts, the Oregon Donation Land Act, the Homestead acts of 1862 and 1909, the Timber and Stone Act, the Swamp Lands Act, the Desert Land Act, the Taylor Grazing Act, and other measures (Hibbard 1965; Gates 1968, 1979). Each one was different in scope and intent. Some people used the means of entry honestly, others perverted their ends, and Central Oregon was one of the many places where land empires were constructed through corruption (Messing 1979; Puter and Stevens 1908). Our rectangular system of land surveys and conveyance, dating from the late 18th century, affected the settlement greatly, for people were constantly saddled with holdings that were a mixture of poor and usable lands. And our insistence upon formal surveys of land also affected the rate and type of settlement.

We know also that some settlements were affected in their makeup by ethnic proclivities. Since the Euro-Americans of Oregon were largely of northern European background, they preferred settlement in valleys rather than on the tops of hills or ridges. In the northern third of the present Prineville District, however, settlement was on the high plateau, partly because the grain fields and sheep ranges were mostly high up--the deep canyons were too narrow in their bottoms, especially after it became necessary to radically increase the size of holdings in the 20th century.

The settlement of the high desert in the southern part of the present Prineville District represents a very interesting display of confidence in technology, farming techniques, hard work, and probably much else. It took place at a time of great national optimism, and it collapsed in the Depression that followed. It has attracted quite a bit of scholarly attention, and there is doubtless much to be discovered still (Allen 1987).

CONCLUSION

As illustrated by the foregoing discussions, human use of the Prineville District over the last 12,000 years has been extremely variable in kind and intensity. The ethnographic cultures are recognizable in the archaeological record to some degree, particularly for the most recent prehistoric period, but probably are much less representative of very early times. In terms of adaptive modes, ethnographic cultures appear to correlate well with the logistical, centrally-based, lifeway that appeared during the Middle Archaic, though they may not be close analogues to Middle Archaic cultures at finer levels of resolution. The arrival of Euro-American culture marks the most abrupt cultural discontinuity in the entire record, and one that deserves more detailed archaeological inspection.

Altogether, the course of human cultural development in north-central Oregon has left to us a rich body of information about the local sequence of events as well as about cultural processes in general. The remainder of this document is devoted to study of cultural resource data from BLM properties in the context of the presently understood cultural setting, and to consideration of future research and management directions.

4. ENVIRONMENTAL ASSOCIATIONS

The purpose of this chapter is to examine the relationship between humans and the environment within the BLM Prineville District. First, we will briefly discuss those aspects of the project area environment important to human land use, with particular emphasis on the articulation between the environment and land use, as well as how the environment can affect our perceptions of human land use patterns. (Toepel et al. [1980] include a more complete summary of the natural setting in the project area.) Second, we will examine the distribution of archaeological sites across the landscape within the project area. The data from this examination will come from two sources, of which the primary source consists of the computer database of archaeological sites recorded on BLM-administered lands prior to October, 1989 (see Appendix). The secondary source is site distribution information contained in published and unpublished literature pertaining to the project area. The results of this analysis will be presented in a concluding section, where distributional tendencies will be discussed.

An important aspect of cultural resource management is understanding the dynamic and interactive relationship between the environment and human behavior. Analysis of this relationship is certainly not new; it has formed the basis for various anthropological schools of thought, such as cultural ecology, deterministic ecology, and environmental determinism (see Kohler 1988 and citations within). For example, cultural ecologist Julian Steward (1938:2) noted that "topography, climate, distribution and nature of plant and animal species, and, as the area is very arid, occurrence of water" were environmental factors influencing the aboriginal cultures of the Great Basin and the Columbia Plateau. Archaeologists in particular have focused on the relationship between humans and the environment, largely because this relationship is observable in the archaeological record. The attention in this regard has been directed towards settlement patterns (Ammerman 1981; Parsons 1972), and more recently towards predictive modeling (Darsie and Keyser 1985; Judge and Sebastian 1988). Such models allow us to examine and attempt to explain certain aspects of human behavior, particularly those relating to settlement patterns and subsistence strategies. These models also aid management of cultural resources in conjunction with other proposed BLM activities by better establishing a historical context by which sites may be evaluated.

One purpose of the current study is to examine the distribution of cultural resource sites across the landscape within the BLM Prineville District. Our purpose is not to develop a predictive model (such a task is several steps removed from the current undertaking), but to present tendencies apparent in the data. These tendencies may, at a later date, form the basis for developing or testing predictive models, or other hypotheses concerning site locations. In addition, the data generated by the analysis of site distributions will serve as management tools. Kincaid (1988:560-564) lists four management uses for predictive models, all of which apply to the data generated by this study. First, the information presented here can be used to design more efficient cultural resource inventories, as the information needs are more evident. Second, site evaluation will be simplified, as the range of site types, and the similarities and differences between site types, become more apparent. Third, this information makes it easier to set management priorities for protection of sites. As noted by Kincaid (1988:563),

> ...protection and preservation efforts should be directed towards maintaining a representative site pool for each site type for future needs. Modeling provides a basis for determining the array of site types in a particular area...and in some cases can be used to generate population estimates for various site pools.

Fourth, and most important, the information derived from this analysis of site distributions will serve as a planning tool. Land use planners work with generalizations, and thus the lack of specific site-location information is not critical.

THE ENVIRONMENT AND HUMAN LAND USE

The environment is the sum total of our surroundings, consisting of an extremely complex, interrelated set of variables; we are just beginning to realize how deeply intertwined these variables actually are. As stated earlier, the following is a brief discussion of the environment, and its relationship to human land use; it is not intended to reiterate the environmental summary by Toepel et al. (1980).

PRESENT ENVIRONMENT

The area under consideration is the Prineville District, comprised of the entire drainage basins of both the Deschutes and John Day rivers, as well as the northern portion of the Goose and Summer lakes basin (Figure 1.2). This region includes a high degree of geographic diversity, with up to five physiographic provinces defined within the project area. The head of the Deschutes Basin originates in the High Cascades, High Lava Plains, and Basin and Range Provinces. The middle and upper reaches of the John Day and Crooked rivers are in the Blue Mountains Province; the middle and lower reaches of the Deschutes River and the lower reaches of the John Day River are in the Columbia Basin Province (Baldwin 1986:5; Franklin and Dyrness 1988:6; Loy 1976:108). While these physiographic divisions serve to illustrate the diversity in the project area, there is enough homogeneity between some provinces that the Natural Heritage Advisory Council (1988:18) combines the High Lava Plains and Columbia Basin into a single province, and Rosenfeld (1985:40) incorporates the Basin and Range, High Lava Plains, Blue Mountains, and Columbia Basin into the Columbia Intermontane Province.

Diversity in the Prineville District is readily apparent in the geologic structure. The characteristic feature of the Columbia Basin Province is the Columbia River Basalt formation, a large, deep basalt mantle deposited during the Miocene epoch (5 to 26 million years B.P.). The Blue Mountains Province consists of several mountain ranges separated by faulted valleys and synclinal basins, while the Basin and Range Province is characterized by fault block mountains and enclosed basins. Both the High Cascades and High Lava Plains are distinguished by young (often Holocene [post 11,000 B.P.]) lava flows with periodic cinder cones and lava buttes (Baldwin 1986; Franklin and Dyrness 1988:25-38; Loy 1976:119). These geologic contrasts translate into topography ranging from the extremes of deep, nearly vertical-sided canyons, formed by the John Day and Deschutes rivers eroding through Columbia Basin basalt, to the extensive flat plains common in the Basin and Range and High Lava Plains provinces.

Climate is a major determinant of water availability, soil composition, and biotic ecosystems. The Prineville District climate is best described as semi-arid, and, as with all of the Pacific Northwest, is influenced by the Cascade Range. The project area, particularly, is in the rain shadow of these mountains, and thus has reduced precipitation. The resultant relative sparsity of cloud cover translates directly into greater seasonal temperature ranges. Annual precipitation is in the general range of 10 to 20 inches (25 to 51 cm), with up to 30 inches (76 cm) in the higher elevations. Precipitation falls mainly as snow during the winter. The mean January temperature is 20 to 30°F (-7 to -1°C), although in some locations the daytime temperatures might not rise above 0°F (-18°C). Daytime temperatures in July commonly reach into the 80 to 90°F (27 to 32°C) range, with higher temperatures not infrequent (Franklin and Dyrness 1988:38-42; Jackson 1985:49-57).

The Prineville District's hydrologic setting is dominated by the Deschutes and John Day rivers, both tributaries to the Columbia River, the northern boundary of the District. The Columbia River is the fourth largest river in North America, emptying 180 million acre-feet into the Pacific Ocean annually (Holbrook 1974). The Deschutes River drains the western half of the Prineville District. It is joined in the upper reaches by the Little Deschutes River, and subsequently by three first-order permanent rivers originating in the relatively moist Cascade Range (the Metolius, Warm Springs, and White rivers), as well as a number of smaller, but permanent, streams. The eastern portion of the Deschutes River drainage is relatively xeric; the only major tributary joining from the east is the Crooked River, originating in the Ochoco Mountains. The eastern side of the lower Deschutes River is characterized by numerous intermittent streams in deeply incised canyons. The porous volcanic structure of much of the drainage allows precipitation to percolate downward into the substrata and emerges as springs, thus providing a relatively constant source of water (McCammon 1980). As a result, the Deschutes River has a fairly constant flow; it also has a much larger volume than the John Day River. The latter, with its headwaters in the Blue Mountains, has a larger basin than the Deschutes River. Major tributaries include the North and South forks, both of which join the river in the upper reaches. Below this point, the river is joined by numerous streams, the principal ones including Bridge, Butte, Thirtymile, and Rock creeks. Flow is much more dependent upon snowpack meltwater than in the Deschutes River, and thus is more subject to seasonal fluctuations.

The northern portion of the Goose-Summer Lakes Basin is also included within the District; this enclosed basin is composed of lakes and playas. No permanent water sources presently exist within the District's portion of this basin. In addition, Hood River, Willow Creek, and numerous small streams flow directly into the Columbia River along the northern edge of the District.

Soils vary considerably within the District. The High Cascades Province and the western edge of the High Lava Plains Province are dominated by immature soils formed in volcanic ejecta; soils developed in glacially deposited materials are also present in the High Cascades. Lacustrine and alluvially derived soils are located in the High Lava Plains Province. Four distinct soil regions, which correlate with annual precipitation, are present in the Columbia

Basin Province. In the Blue Mountains, there are two distinct soil units (one associated with moderate-to-high elevation forests, and the other with lower-elevation grassland or grass-shrubland) (Franklin and Dyrness 1988:25-37).

Biotic communities vary considerably within the Prineville District. Ponderosa pine (Pinus ponderosa) characterizes the dominant plant community on the eastern flanks of the Cascade Range, and stands also are found in the Blue Mountains Province. Dominant stands of grand fir (Abies grandis) can be found in the same general areas, but at moister, higher elevations. A zone of western juniper (Juniperus occidentalis) is present throughout much of Central Oregon, particularly in the moister areas of the High Lava Plains Province; it frequently co-occurs with ponderosa pine. Steppe communities, including those dominated by big sagebrush (Artemisia tridentata), can be found in the more xeric portions of the project area (particularly in the Columbia Basin and High Lava Plains provinces), as well as in a steppe zone of drought-tolerant grasslands (Franklin and Dyrness 1988; Loy 1976:144-145). Numerous animal species are found throughout the project area, including large mammals such as deer (Odocoileus spp.), elk (Cervus spp.), and pronghorn antelope (Antilocarpa americana). The major rivers serve as migratory routes and wintering locations for waterfowl (Bailey 1936; Loy 1981:154-169). Chinook salmon (Oncorhynchus tshawytscha) spawned in the upper John Day River in the spring and summer; fall runs were limited to the mouth of this river (anadromous fish runs and implications for aboriginal utilization is discussed in more detail in Chapter 3, Synthesis and Interpretation of Cultural Resource Data). Steelhead trout (Salmo gairdnerii), silver salmon (O. kisutch), and coho salmon (O. kisutch) also migrated up the John Day River (Fulton 1968, 1970; Schalk 1980). Steelhead trout are common in the middle Deschutes River and Crooked River drainages, and sockeye salmon (O. nerka) run in the Metolius River and spawn in Suttle Lake. Chinook salmon are apparently rare in the Deschutes River drainage, and Steelhead Falls (near Redmond) is a major barrier to fish migration. However, this feature dates to Late Pleistocene or Early Holocene times, and thus it is possible that, prior to this blockage, anadromous fish may have migrated farther up the Deschutes River than at the present time (Amy Stewart, personal communication 1990).

ENVIRONMENTAL FACTORS AFFECTING HUMAN LAND USE

Environment is probably the single largest factor influencing human land use. It determines the kinds and availability of food resources, types and abundance of water, variety and distribution of raw materials, ease and methods of travel, and climatic conditions suitable for survival (and comfort). Two environmental variables in particular, geologic structure and climate, form the environmental foundation, and most strongly influenced how humans articulate with the landscape. On a macro scale, geologic structure influences soil composition, landforms, hydrologic patterns, microclimatic patterns, and biotic ecosystems. On a smaller scale, this variable directly affects human land use through the availability and distribution of minerals and fine-grained stone suitable for tool manufacture. Climate similarly circumscribes soil development, water quantity and availability, and biotic communities, and directly affects weather conditions influencing land use.

These environmental factors were mostly irrelevant to the early historic settlement of Central Oregon, which was governed very directly by the occurrence of gold deposits through many of the headwaters of the John Day River. Roads leading to these mining districts attracted toll houses, way stations, ranches and farms that supplied the mines, the travelers along the roads, and the troops garrisoned at camps Watson, Lincoln, Polk, Logan, Wright, Colfax, Harney, Maury, etc. for protection. The troop garrisons were placed mainly to stand athwart the roads and to block the approaches to the Canyon City vicinity (Chance n.d.). Most of the early mining was by placering, so camps and towns grew on creeks. But sometimes they were fairly high in the mountains, especially as hard rock mining took hold at the sources of the placer deposits. Other minerals became quite important and had a major influence on land use. Loy (1976:60-61) indicates that all of the following have been or are being mined in the project area: diatomite, pumice and cinders, gypsum, perlite, zeolite, chromium, copper, lead, zinc, gold, silver, mercury, and uranium. Areas with oil, gas, and coal have been identified also.

With the discovery of summer fallowing, the use of irrigation, and precipitation that was often just enough to get by in practically every part of north-central Oregon, settlement flowed after 1880 into virtually every environment, from the hot canyon bottoms along the John Day River to the cool meadows of the Ochocos, to the deserts around Millican and Redmond. People hardly thought of environmental determinism until the late 1920s and early 1930s when much of the terrain began to look less friendly. But because of the optimism and better growing conditions of early 20th century, we find homesteads, and related vestiges like schools, cemeteries, and dumps, in the most unlikely places. While water was always necessary, it seems that some people in the high desert were able to get by with very little, and were able to get enough from wells or springs to survive. Now it is frequently difficult to imagine where some of these homesteads found their water.

Aboriginally, fine-grained stone suitable for tool manufacture, such as cryptocrystalline silicas (CCS) and obsidian, were extremely important. Major sources of obsidian have been identified within or adjacent to the project area, including Glass Buttes, Newberry Crater, Quartz Mountain, Cougar Mountain, Riley, and the Three Sisters area (Hughes 1986:285; Skinner 1986:12; Toepel et al. 1983). CCS sources are quite common; Nolan (1985:124-131) notes 10 sources of CCS within the project area, and many more undoubtedly exist. That aboriginal people incorporated raw material sources into land use patterns is very clear; 22 sites in the Prineville District's archaeological database are considered to be lithic quarry sites. During the historic period, CCS and obsidian continued to play a role in land use (although a minor role, for hobby rock collectors).

Clearly, aboriginal site types often are related to landforms. Certain site types require particular topographic features; talus pits require talus fields, rockshelters require a natural shelter (and thus a cliff, rimrock, or lava tube), and some sort of panel is necessary for rock art. Thus, these site types can be directly associated with certain landforms. Other landforms, such as steep slopes, inhibit particular site types; it is unlikely to find a village on a steep slope, while other site types, such as rock features and quarries, are not necessarily limited by slope. Conversely, certain topographic features should be more attractive to particular site types. Large, flat alluvial terraces with permanent water sources would seem to be the best places for extended habitation sites.

Volcanic activity within and adjacent to the project area probably has significantly influenced human land use. After seeing the destructive power of the Mount St. Helens eruption, it is probable that such episodes as Mt. Mazama at 6700 B.P., Newberry Crater at 6700, 3500, and 1400 B.P., Lava Butte at 6150 B.P., and Sand Mountain and Belknap Crater at 3400 B.P. (Davis and Scott 1986; Randle et al. 1971; Walker and Nolf 1981; Williams 1976) would have had devastating affects on human behavior. While previous studies on this topic near the study area (Grayson 1979; Matz 1987) have been inconclusive, we suggest that numerous changes would have occurred. Settlement and subsistence strategies would have changed as resources previously available were suddenly gone, occupation sites became uninhabitable, and lava flows made travel routes impassable. Entire ecosystems would have vanished; rivers and streams would become choked with debris, decimating aquatic resources. Volcanic activity would certainly have had far-reaching impacts on all aboriginal site types.

Certain unique geologic features are important aspects of human land use. Geothermal springs, such as Warm Springs within the project area, have been important throughout the prehistory and history of the world. Aboriginally, geothermal springs may have been used for medicinal purposes, as locations for villages, and for non-therapeutic purposes such as cooking food and preparing animal hides (Griffin 1986).

While some aspects of the geologic setting influence human land use, other attributes (particularly those relating to geomorphology) bias our perception of land use patterns, and thus are as important to our understanding of these patterns as are the patterns themselves. One prime example in the project area is volcanic activity -- not only were land use patterns altered, but ejecta undoubtedly covered evidence of aboriginal land use, leaving as observable only those patterns created after eruptions. Another geomorphic process which can create misleading perceptions of land use is fluvial action. Landforms such as alluvial terraces might have formed an integral part of land use patterns, but subsequent alluviation has buried, or erosion has removed, the evidence. Such landforms can, in fact, be removed completely, leaving no evidence whatsoever of their former existence.

Climate has a direct affect on human land use patterns largely through weather conditions inhospitable for extended use. For instance, village sites are not likely at elevations with a winter snow pack, nor are sites used for winter habitation likely on open, wind-swept plateaus. Indirectly, climate is a determinant of soil development, the types and amount of water present, and biotic ecosystems.

Water certainly has been, and continues to be, an important factor affecting human land use. We would expect a direct relationship between availability of potable water and village sites (and other sites where extended stays were planned). Conversely, proximity to water might not have been so important for other site types (such as rock features or rock art), where use was short-term and carrying water was possible. Water also directly influences land use by providing habitat for aquatic resources. Salmon, steelhead trout, and shellfish were all extremely important components of aboriginal diet, to the extent that some subsistence strategies revolved around the availability of fish (this is discussed further in Chapter 3, *Synthesis and Interpretation of Cultural Resource Data*). Specific site types are directly associated with certain aquatic resources; shell middens correlate directly with the collection of shellfish, while fishing stations are often located at blockages or constrictions of major rivers. These waterways also may have served as travel routes.

Effective moisture and soil composition are primary determinants of vegetation communities, which in turn are controlling factors in the development and stabilization of fauna communities. Flora and fauna probably are the greatest direct determinants of aboriginal land use patterns, due to the obvious importance of food harvest. Sites devoted to specific resources, such as berries, nuts, roots, fish, or shellfish, are to be expected at or near the locations of such resources. These site types would include artifact scatters (including those sites with high concentrations of ground stone items) and shell middens. We might expect habitation sites (those with extended occupations) to be located in proximity to multiple biotic resources, rather than a single resource which might become quickly depleted. Other site types (e.g., quarries, cairns, and rock art) are not necessarily associated with biotic resources.

Vegetation communities can directly affect how we perceive land use patterns by influencing "site discoverability" (cf. Pettigrew 1985). Forest communities, with relatively thick humic layers, tend to obscure surface visibility, making it difficult to locate sites. Conversely, shrub communities have a much higher degree of surface visibility, where sites are easier to discover, thus weighing our perceived distribution of sites towards vegetation communities with less ground cover.

This discussion has focused on how human land use might be influenced by the environment, and how the environment influences our perceptions of past land use. Conversely, some land use patterns may reflect, or be influenced by, human manipulation of the environment. If a local environmental variable (or variables) can be intentionally altered, then some degree of control is exerted over the environment, and land use may reflect the altered environment. That aboriginal peoples intentionally manipulated their environs is clear (Silvermoon 1985), and often caused changes in vegetation communities, either by modifying water availability, or by burning to alter natural ecological succession. For instance, Steward (1933) reported that the Owens Valley Paiute in California developed an extensive and elaborate irrigation system to facilitate root crops. One primary means of altering vegetation during the prehistoric period throughout North America was through the use of fire. Stewart (1956) suggested that these fires may have been used as hunting aids, to increase plant growth and improve pasturage, as offensive or defensive weapons, to remove travel hinderances, to drive away mosquitoes, and as a deterrent to snakes. In the Prineville District, French (1957) notes that fires were used to maintain open areas, promoting the growth of desirable plant species (such as huckleberries). Elsewhere in Oregon, intentional burning was reported in the Willamette Valley (Johannessen et al. 1971) and by the Takelma in the southwestern corner of the state (Sapir 1907). One type of environmental alteration practiced by the aboriginal peoples of the Prineville District was the building of fishing weirs, thus creating artificial constrictions in channels, and perhaps modifying land use patterns relating to fishing.

PALEOENVIRONMENT

The previous discussion has focused on the environment as if it were static. Obviously, this is not the case. Paleoclimatic studies by Antevs (1948, 1955), Hansen (1942, 1947a, 1947b), Heusser (1966), and Mehringer (1985) are in general agreement (with some chronological differences) that the postglacial climate in the Pacific Northwest has followed a broad, generalized tripartite pattern. After the last glacial retreat (ca. 10,000 B.P.), the climate was cooler and moister than today, but by ca. 7500 B.P. had become more arid, and resembled the current conditions. This period is termed the "Anathermal" by Antevs. The warming and drying continued, creating a period between ca. 7500 and 4000 B.P. which was more arid than today (Antevs' "Altithermal"); this was followed by a return to conditions similar to the current climate, called the "Medithermal" by Antevs. Since these pioneering studies, numerous investigators from various disciplines have conducted paleoenvironmental research (see Lyman et al. 1983 and citations within), and it is now quite obvious that local microenvironments may, or may not, have followed these generalized climatic patterns (Fagan 1974; Mehringer 1985), and that there may have been significant climatic fluctuations within the broader patterns. For this reason, an understanding of human land use patterns through time requires knowledge of the local paleoenvironment, and archaeological investigators more and more frequently are incorporating palynological data into studies of aboriginal land use patterns (e.g., Jones 1984, Lebow and Pettigrew 1989a, Pettigrew and Lebow 1989, and Reid et al. 1989 all use palynological information in attempts to discern aboriginal land use patterns in southeastern Oregon). One factor which makes local paleoenvironmental data even more crucial to the Prineville District is the tremendous amount of volcanic activity that has taken place in this region; this type of geologic activity may well have influenced the local environment significantly.

Unfortunately, there has been little paleoenvironmental research within the Prineville District. Mazany (1980) constructed a tentative tree-ring chronology dating back 380 years in the Clarno Basin. None of the trees used showed any sign of abnormal stress, indicating a relatively stable climate during this period. Periodic climatic shifts were noted every 20 to 30 years. Hansen (1947a:115) conducted palynological studies at Tumalo Lake, revealing that during the cooler and moister postglacial period the forests may have extended to a lower elevation than apparent today, and were replaced by grasslands when the climate became warmer and drier.

Although paleoenvironmental data are sadly lacking for the Prineville District, several generalizations about human land use can be suggested, based on the broad, tripartite climatic scheme (keeping in mind, of course, that there is evidence suggesting that certain microenvironments changed little [cf. Fagan 1974]). The moist conditions of the early Holocene contributed to a lacustrine environment (particularly in the Goose-Summer Lakes Basin) and substantial runoff. Subsistence activities in the southeastern portion of the District would have focused on lake margins and marshy bottomlands (such as proposed for the Western Pluvial Lakes Tradition [cf. Bedwell 1969, 1973; Pettigrew 1984; Pettigrew and Lebow 1989]). North of the Goose-Summer Lakes Basin, the topography is not conducive to lake formation, and runoff was channelled away, but the moist climate would have created marshy conditions (and associated biotic communities) in certain areas. Large browsing and grazing animals probably were more prevalent than today, as the higher effective moisture supported vegetation able to sustain larger animal populations. Therefore, as discussed in Chapter 3, the focus of habitation and exploitation during this initial postglacial period may not have been on the major rivers, and hunting may have played a larger subsistence role than during later times. As the climate gradually became more arid during the mid-Holocene, the marshes, smaller lakes, and streams (and corresponding biotic communities) would shrink or disappear. The lush vegetation supporting large herds of herbivores would likewise have been decimated. Subsistence activities would have included receding lacustrine and riverine environments, but a greater diversity of ecosystems and landforms would have been utilized as the arid climate created harsher conditions and fewer resources. Vegetal foods (roots, berries, nuts) would have become increasingly important. Alluvial downcutting created high terraces or benches of former floodplains and alluvial terraces, and riverine sites of the postglacial period would thus be located on features at elevations above present or extant water sources. Continued aridity and downcutting would deepen canyons further, creating lower, smaller terraces. As the climate became more moist and approached the conditions of today, many of the low terraces and floodplains used in the preceding xeric period may have eroded, removing evidence of earlier riverine-related land use patterns. The subsistence strategies developed during the mid-Holocene may have continued, but new moisture-dependent resources may have been incorporated. The subsistence role that salmon (so important to ethnographically recorded aboriginal groups in the Prineville District) had during these various proposed climatic changes is unclear. Salmon remains are common in archaeological sites excavated along the major rivers (cf. Schalk 1987) postdating 3000 B.P., but reasons for the lack of evidence of fish prior to this time is the subject of debate.

DISTRIBUTION OF CULTURAL RESOURCE SITES

The following discussion focuses on the distribution of cultural resource sites across the landscape within the Prineville District. The data for this analysis are derived from two sources, beginning with sites recorded on BLM land, and followed by distributional information derived from previous reports and publications.

BLM DATABASE

In conjunction with the Prineville District's update of their cultural resource management program, BLM requested that IRI encode all the site records (903 total) for land administered by the District into a dBASE IV computer database file. A hard copy of this database, along with explanations and definitions, is included as Appendix A in Volume II of this report. Although all of the site records encoded into the database were provided to IRI by the Prineville District, 71 of the site records indicate ownership other than BLM. However, because BLM ownership is far from static and the intent clearly was to enter only BLM-administered sites, we have included those sites indicated on the records as non-BLM in the following analyses. The database forms the basis for the information presented in the following discussion of site distributions. It should be noted further that three sites in the Harney drainage basin were included in the database. These particular sites do not fit within the defined study area (the Deschutes and John Day river basins, and the northern portion of the Goose-Summer Lakes Basin), and were excluded from the distributional analyses (and thus the database as used here has 900 records). No sites were encoded in the northwest and northeast corners of the Prineville District (i.e., in the Willow Creek, Hood River, and smaller stream basins draining directly into the Columbia River).

Before examining the site-distribution information derived from the database file, we offer several caveats. The problems associated with the cultural resource database have been discussed previously (see Chapter 2, above), but it is worth summarizing those aspects which can affect our perceptions of site distributions. Foremost among the necessary provisos are the problems relating to sampling. By no means were the sites drawn from a scientifically valid sample of the region as a whole. The distribution of BLM-administered land within the Prineville District is non-random (Figure 4.1). As noted by Polk (1976:6) in his report of the lower John Day River survey:

> ...in most of the easily accessable (sic) portions of the canyon, large, broad river terraces are often privately held while the less desirable hills and bare rock terrain is (sic) publicly owned. Conversely, in most inaccessable (sic) portions of the canyon, the BLM controls all lands -- bare rock and terraces.

With rare exceptions, the locations of the surveys within BLM land are non-randomly distributed. Compliance-level surveys are associated with specific management activities (such as logging, fencing, and water development) which are non-randomly distributed, while other surveys, such as the corridor surveys along the lower Deschutes and John Day rivers (Hibbs et al. 1976; Polk 1976), sampled only along the edges of the rivers. A few surveys, such as in the Redmond Training Area (Lyman et al. 1983), have provided statistically valid samples, but such are the exception rather than the rule.

Considerable variability exists also in the intensity of surveys. Transect intervals (and thus intensity) vary widely between surveys, with intervals ranging from 15 m to 200 m. Some surveys were strictly "opportunistic" (inspection only where sites were considered likely).

A third caveat is that site definitions differ considerably between site recorders (and possibly even for a single recorder over time), also affecting the perceived patterns of site distributions. (See discussion in Chapter 2, *Data Reliability*).

The final proviso noted here (others are discussed as they pertain to particular site distributions) is the wide variability in the completeness of the site records. Many recorders did not include information relating to environmental variables (see below) used in this discussion of site distributions, and thus the total sample is reduced, and biased toward those sites for which the variables were recorded. On a more satisfactory note, a single individual (Lebow) encoded all the site records on the database, thus introducing a much higher degree of consistency among site records than would have been possible if numerous people had been involved.

SITE DEFINITIONS

Twelve different site types are recorded within the project area; these types are derived from the BLM database manual (Bureau of Land Management 1989:7). The following site type definitions were used during data entry. Artifact scatters are featureless concentrations of historic or prehistoric cultural debris; midden sites are also featureless, and are characterized by concentrations of shell or anthropic, organic-darkened soil. Rock feature

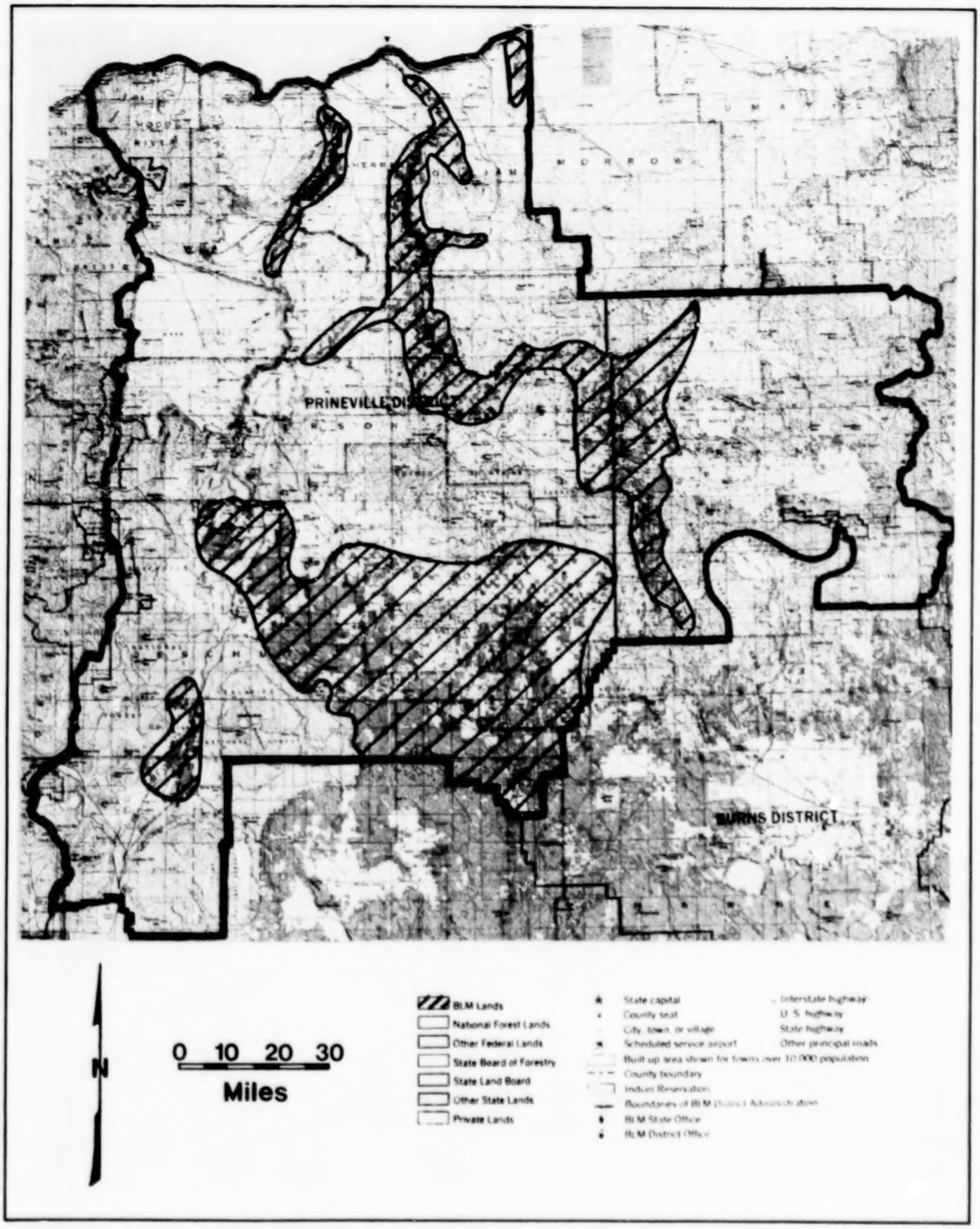


Figure 4.1. Distribution of BLM-Administered Land within the Prineville District.

sites are characterized by a configuration of stones, such as a rock ring, cairn, or alignment. Shelters/cave sites are those in which evidence of human use is present in a natural rock shelter. Quarry sites are associated with the extraction of lithic materials. Sites were assigned to this category if the recorder called the site a quarry, or if lithic debitage was reported in association with raw material. Sites with features, such as housepits or rock rings, are defined as open sites. Rock art sites include both pictographs and petroglyphs; a burial site is one in which human remains are the predominant feature. An architectural structure site is one in which a standing structure (or structures) was the focus during site recordation, while engineering structure sites are those whose purpose is to perform work, and require some level of engineering skill to construct. Sites that fit no other categories are included in the other category (such as dendroglyphs or corrals). In addition, the BLM database manual lists "isolate" as a site type; a single site in this category was entered into the database.

Sites with complex structures that fit more than one type definition created problems when assigning site types, and often necessitated subjective decisions during data entry. For instance, what is the site type for a rockshelter with rock art on the walls? It also was often difficult to assign a site to a particular type-- is a partially collapsed cabin an architectural structure, or an artifact scatter? The determining criterion we used in these cases was the emphasis of the recorder: if the recorder emphasized one aspect of the site more than others, then the site was assigned to the type emphasized.

The following examination of site distributions focuses on the relationship of site type with these environmental variables: drainage basin, drainage sub-basin, elevation, plant community, water source, distance to water, primary and secondary landforms, aspect, and slope. Conspicuous in its absence as an environmental variable is soil. The reason for this exclusion is that over 100 different soil designations are used in those sites with recorded soil descriptions (803); the samples of sites per soil designation is so small that distributional data are meaningless.

The frequency of sites within those variables relating to a geographic area (physiographic province, drainage basin and sub-basins, elevation, and plant community) may be partially or completely related to the physical area encompassed by the variable, and to the area of BLM land which has been inventoried. Unfortunately, these areal figures are not available (Richard Hanes, personal communication 1990), so that counts of sites by type have little meaning, and site density figures are unattainable. The only possible means of deriving the acreage surveyed per variable would be to examine the survey documents in the SHPO, a task well beyond the scope of this study. We had originally intended to use the SHPO's bibliographic database in order to derive the acreage of BLM land surveyed, but have since learned that the state database is missing information prior to 1978, and for the years 1981 through 1983, thus rendering it useless for our purposes (Le Gilsen, personal communication 1990). The data are presented as relative frequency (percentage) of site types per variable.

The distribution of sites is presented for both historic and prehistoric sites, as the distribution may vary between these periods. For this analysis, the historic and prehistoric component at a single site are treated as separate sites (thus, there appears to be more than 900 sites in some of the totals). However, the database file structure allows no means to indicate that a site is prehistoric if period-specific data are not recorded. As a result, sites with both historic and prehistoric components are indicated only as historic unless prehistoric period-specific information is recorded. This could bias the data towards the historic sites (i.e., the number of historic sites is accurate, but the number of prehistoric sites is under represented.) For example, two historic sites are tallied as open sites because they have both historic and prehistoric components, but with no temporal indicators in the prehistoric component.

We considered presenting the distribution of prehistoric site types by temporal period within each of the environmental variables (in an effort to determine changes in land use through time), but chose otherwise for several reasons. Only 107 prehistoric sites have any sort of temporal indication, and to subdivide this sample by site type and enviromental variable would have created extremely small samples. All of the chronological assignments are based on projectile point styles; placement in specific periods during data entry was based on sketches of points or named types, which could introduce considerable error. In addition, a projectile point observed on the surface of the site may have little or no relevance to the actual period of site use. For these reasons, the prehistoric sites are considered altogether, without regard to temporal period, in the following analysis.

FREQUENCY OF SITE TYPES IN THE PRINEVILLE DISTRICT

With the foregoing provisos in mind, a discussion of the distribution of cultural resource sites is possible. As shown in Table 4.1, the most common site type found within the Prineville District is, by far, the artifact scatter (61.7%). This is true for both historic (50.9%) and prehistoric (64.3%) sites. A possible reason for the preponderance of artifact scatters is that these sites represent a wide range of functions when compared to the other site types. Among prehistoric sites, the second most prevalent type is the open site (13.1%), followed by the shelters/cave type (8.7%). The second most common historic site type is the architectural structure (18.1%), followed by engineering structures (14.0%) and then the site type "other" (10.5%). Some of the site types are associated only with either the historic or prehistoric periods: the recorded burial sites are historic (prehistoric burials or possible burials were recorded within sites, but they were not the focal point of the site description), as are engineering structures. Conversely, midden, quarry, rock art, and isolate site types are all prehistoric. Interestingly, one prehistoric site (a structure of juniper branches) was entered as an architectural structure.

Basins

When the frequency of site types in the three major drainage basins within the project area (the Deschutes and John Day rivers, and the Goose-Summer Lakes basin [Figure 4.2]) is examined, some interesting differences and similarities are apparent (Table 4.2). The frequencies of site types within the Deschutes and Goose-Summer Lakes basin are similar. Of course, the physical area under consideration within the Goose-Summer Lakes basin is relatively small, with a correspondingly much smaller sample of sites, and therefore some of the less frequent site types in the Deschutes basin are not present in the Goose-Summer

Table 4.1. Frequency of Prehistoric and Historic Site Types in the Prineville District.

Site Type	Historic (%)	Prehistoric (%)	*TOTAL (%)*
Architectural Structure	31 (18.1)	1 (0.1)	32 (3.5)
Artifact Scatter	87 (50.9)	471 (64.3)	558 (61.7)
Burial	2 (1.2)	0 (0.0)	2 (0.2)
Engineering Structure	24 (14.0)	0 (0.0)	24 (2.7)
Isolate	0 (0.0)	1 (0.1)	1 (0.1)
Midden	0 (0.0)	32 (4.4)	32 (3.5)
Open Site	2 (1.2)	96 (13.1)	98 (10.8)
Other	18 (10.5)	3 (0.4)	21 (2.3)
Quarry	0 (0.0)	21 (2.9)	21 (2.3)
Rock Art	0 (0.0)	18 (2.5)	18 (2.0)
Rock Feature	5 (2.9)	26 (3.5)	31 (3.4)
Shelters/Cave	2 (1.2)	64 (8.7)	66 (7.3)
TOTAL	171 (100.0)	733 (100.0)	904 (100.0)

Lakes basin. Artifact scatters (both historic and prehistoric) are relatively more common within the Deschutes and Goose-Summer Lakes basins than within the John Day basin. Conversely, prehistoric open and shelters/cave sites are more frequent in the John Day basin than in the other basins. Midden sites are found within the Deschutes basin, but not elsewhere (this fact will be discussed in more detail later in this chapter). The remaining prehistoric site types with more than one site represented (quarries, rock art, rock features, and the "other" site type) are similarly represented in all three basins (with the proviso of the smaller sample size in the Goose-Summer Lakes basin).

As already mentioned, historic artifact scatters follow the same pattern as prehistoric artifact scatters in their lower frequency in the John Day basin than in the other two basins. Architectural structure sites are much more frequent in the John Day basin than elsewhere (and are absent from the Goose-Summer Lakes basin). Engineering structures comprise a significant proportion of the sites in the Deschutes River and John Day basins, but like architectural structures are absent from the Goose-Summer Lakes basin. The "other" site type is the second most common in the Deschutes basin, but is absent in the Goose-Summer Lakes basin, and is a relatively minor site type in the John Day basin.

Several inferences can be drawn from these data. Clearly, the presence of midden sites in the Deschutes basin, along with their absence elsewhere, is significant in terms of settlement and subsistence patterns, and suggests that either the Deschutes River is the only

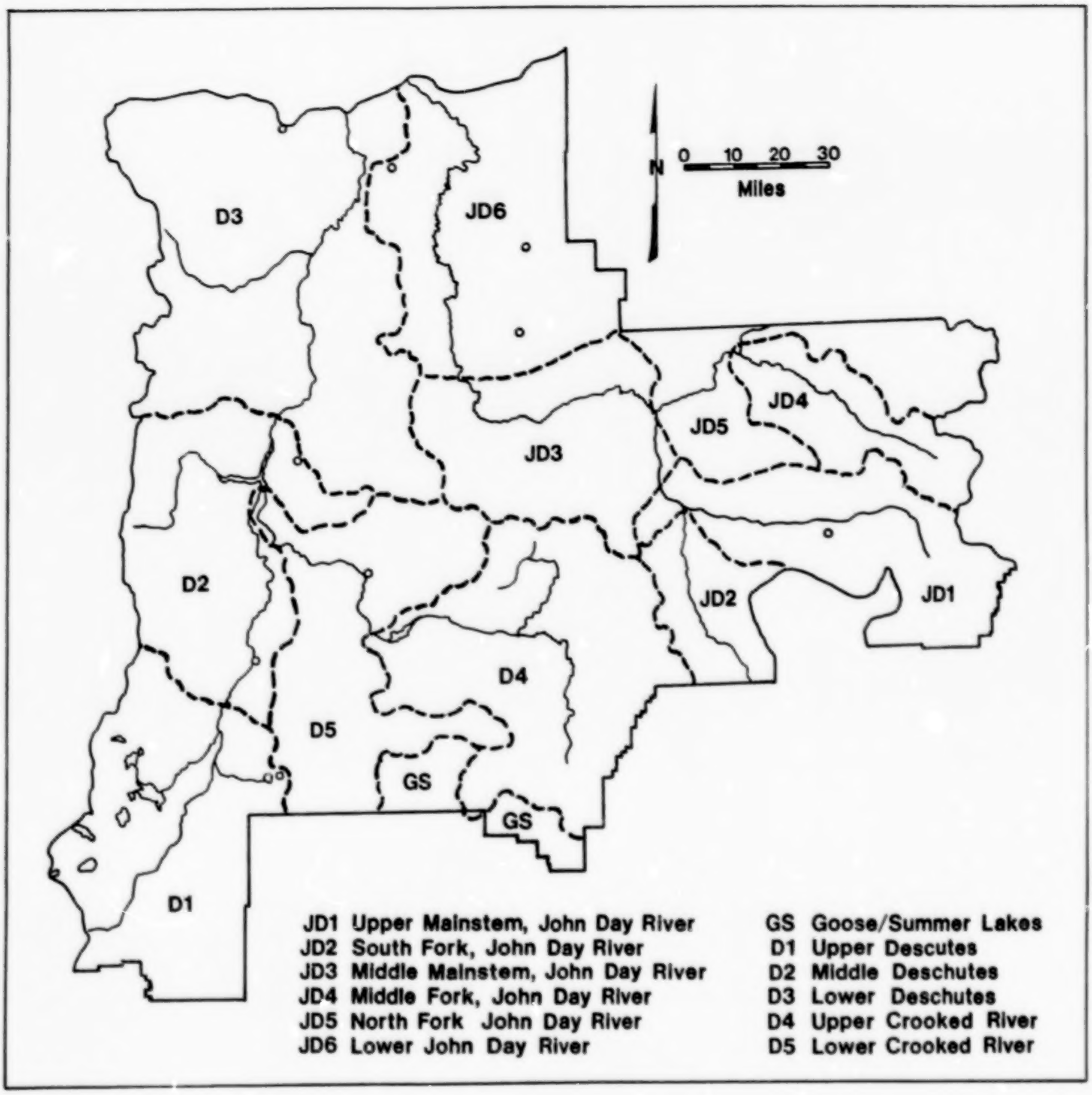


Figure 4.2. Basins and Sub-basins within the Prineville District.

river capable of supporting a freshwater shellfish population, or else was the favored location for gathering shellfish (this will be discussed in greater detail below). The relatively higher proportion of open sites and shelters/cave sites, both of which often are associated with extended periods of habitation, in the John Day Basin suggests several possibilities: that this basin had a greater human population, it was preferred for habitation over the other basins, or that surveys have been biased toward areas where such sites tend to be found. As shown in Figure 4.3, major cultural resource surveys have been conducted in both basins; it would

Table 4.2. Relative Frequency of Prehistoric and Historic Site Types by Basin. (Numbers in parentheses are percentages.)

PREHISTORIC

Basin	Arch. Struct.	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
Deschutes	1 (0.2)	344 (68.5)	1 (0.2)	32 (6.4)	44 (8.8)	2 (0.4)	12 (2.4)	10 (2.0)	19 (3.8)	37 (7.4)	502 (100.0)
John Day	0 (0.0)	92 (49.5)	0 (0.0)	0 (0.0)	48 (25.8)	1 (0.5)	6 (3.2)	8 (4.3)	5 (2.7)	26 (14.0)	186 (100.0)
Goose/Summer	0 (0.0)	35 (77.8)	0 (0.0)	0 (0.0)	4 (8.9)	0 (0.0)	3 (6.7)	0 (0.0)	2 (4.4)	1 (2.2)	45 (100.0)
TOTAL	1 (0.1)	471 (64.3)	1 (0.1)	32 (4.4)	96 (13.1)	3 (0.4)	21 (2.9)	18 (2.5)	26 (3.5)	64 (8.7)	733 (100.0)

HISTORIC

Basin	Arch. Structure	Artifact Scatter	Burial	Eng. Structure	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
Deschutes	11 (10.0)	65 (59.1)	1 (0.9)	14 (12.7)	1 (0.9)	15 (13.6)	3 (2.7)	0 (0.0)	110 (100.0)
John Day	20 (33.9)	21 (35.6)	1 (1.7)	10 (16.9)	1 (1.7)	3 (5.1)	2 (3.4)	1 (1.7)	59 (100.0)
Goose/ Summer	0 (0.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (50.0)	2 (100.0)
TOTAL	31 (18.1)	87 (50.9)	2 (1.2)	24 (14.0)	2 (1.2)	18 (10.5)	5 (2.9)	2 (1.2)	171 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. = Engineering

appear that this distribution of open sites and shelters/cave sites is possibly related to cultural factors, but bias in survey coverage seems a more likely cause. The same can be suggested for architectural structures (very frequent in the John Day basin). The lack of this site type in the Goose-Summer Lakes basin is not too surprising, given that this basin is more arid than the other two, and has no major water sources within the study area (Figure 4.2). In fact, given the relative lack of water in the Goose-Summer Lakes basin, it is notable that prehistoric open sites are present within this basin, even in relatively greater proportion than in the Deschutes basin.

Deschutes Sub-basins

The distribution of site types can be examined in greater detail by looking at the sub-basins within the basins. The sub-basins used here were defined by Oregon's Water Resources Department, as promulgated by the State Historic Preservation Office (n.d.). Five sub-basins are defined within the Deschutes basin (Figure 4.2); Table 4.3 presents the relative frequencies of site types within these sub-basins. A disparity in the distribution of prehistoric artifact scatters is immediately apparent: in the Lower Deschutes sub-basin, only 12.5% of

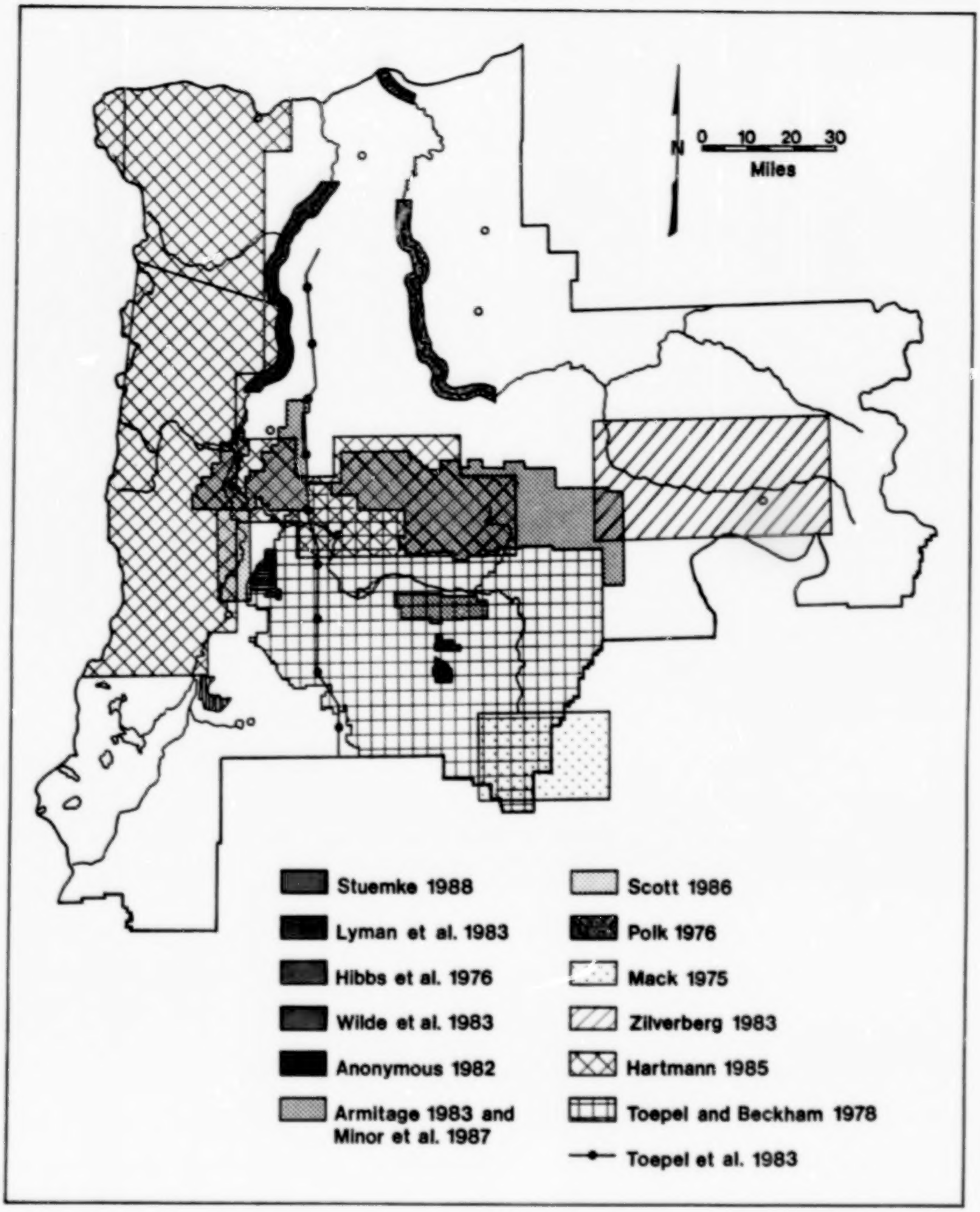


Figure 4.3. Locations of Major Projects Addressing Human Land Use within the Prineville District.

Table 4.3. Relative Frequency of Prehistoric and Historic Site Types by Deschutes River Sub-basins. (Numbers in parentheses are percentages.)

PREHISTORIC

Sub-basin	Arch. Struct.	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
Lower Deschutes	0 (0.0)	18 (12.5)	0 (0.0)	31 (21.5)	40 (27.8)	0 (0.0)	7 (4.9)	5 (3.5)	18 (12.5)	25 (17.4)	144 (100.0)
Middle Deschutes	0 (0.0)	35 (72.9)	0 (0.0)	1 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)	3 (6.3)	0 (0.0)	9 (18.8)	48 (100.0)
Upper Deschutes	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
Lower Crooked	0 (0.0)	31 (86.1)	0 (0.0)	0 (0.0)	1 (2.8)	0 (0.0)	0 (0.0)	1 (2.8)	1 (2.8)	2 (5.6)	36 (100.0)
Upper Crooked	1 (0.4)	257 (94.8)	1 (0.4)	0 (0.0)	3 (1.1)	2 (0.7)	5 (1.8)	1 (0.4)	0 (0.0)	1 (0.4)	271 (100.0)
TOTAL	1 (0.2)	344 (68.5)	1 (0.2)	32 (6.4)	44 (8.8)	2 (0.4)	12 (2.4)	10 (2.0)	19 (3.8)	37 (7.4)	502 (100.0)

HISTORIC

Sub-basin	Arch. Structure	Artifact Scatter	Burial	Eng. Structure	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
Lower Deschutes	1 (5.0)	8 (40.0)	0 (0.0)	5 (25.0)	0 (0.0)	4 (20.0)	2 (10.0)	0 (0.0)	20 (100.0)
Middle Deschutes	1 (6.7)	10 (66.7)	0 (0.0)	2 (13.3)	0 (0.0)	2 (13.3)	0 (0.0)	0 (0.0)	15 (100.0)
Upper Deschutes	4 (14.3)	18 (64.3)	0 (0.0)	5 (17.9)	0 (0.0)	1 (3.6)	0 (0.0)	0 (0.0)	28 (100.0)
Lower Crooked	0 (0.0)	9 (69.2)	1 (7.7)	1 (7.7)	0 (0.0)	2 (15.4)	0 (0.0)	0 (0.0)	13 (100.0)
Upper Crooked	5 (14.7)	20 (58.8)	0 (0.0)	1 (2.9)	1 (2.9)	6 (17.6)	1 (2.9)	0 (0.0)	34 (100.0)
TOTAL	11 (10.0)	65 (59.1)	1 (0.9)	14 (12.7)	1 (0.9)	15 (13.6)	3 (2.7)	0 (0.0)	110 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. = Engineering

the sites are artifact scatters, while this site type represents 100.0% and 94.8% of the sites in the Upper Deschutes and Upper Crooked sub-basins, respectively. Conversely, open and midden sites are the first and second most common site types in the Lower Deschutes sub-basin, while midden sites are absent in all the other sub-basins except the adjacent Middle Deschutes sub-basin (only 2.1%). Open sites are absent in the Middle and Upper Deschutes sub-basins, and are present, but infrequent, in the Crooked River sub-basin. The shelters/cave site type is much more frequent in the Lower and Middle Deschutes sub-basins than in the other sub-basins. Rock feature sites are also more frequent in the Lower Deschutes sub-basin than elsewhere, as are quarry sites. Rock art sites are relatively equally well represented in all sub-basins. One surprising aspect of site distributions is the presence of three prehistoric open sites and one prehistoric architectural structure in the Upper Crooked sub-basin. Two of the open sites are situated in Big Summit Prairie, an open, upland prairie; this setting for this type of site was not anticipated, based on previous archaeological and ethnographic information. The overall pattern that emerges clearly from the distribution of sites within the Deschutes Basin is that there is a higher degree of evenness (less variability in the relative proportions) in the frequency of prehistoric site types in the Lower Deschutes sub-basin than in the other sub-basins. Another clear pattern is the diversity of site types: the Lower Deschutes sub-basin has seven different prehistoric site types present, which is surpassed only by the Upper Crooked sub-basin, where eight different prehistoric site types are recorded. This degree of diversity is not present in the other sub-basins within the Deschutes Basin, which also correspondingly have a much lower population of sites.

Among the historic sites in the Deschutes Basin, artifact scatter sites are the most common site type in all sub-basins, although this type is relatively less prevalent in the Lower Deschutes sub-basin than in the other sub-basins (Table 4.3). Conversely, engineering structures are present in all sub-basins, and are most frequent in the Lower Deschutes sub-basin. Architectural structures are present in all sub-basins except the Lower Crooked, and are most frequent in the upper sub-basins of both the Deschutes and Crooked Rivers. Rock features are better represented in the Lower Deschutes sub-basin than elsewhere, while the "other" site type is approximately equally frequent in all sub-basins. The overall distributional pattern of site-type evenness in the Lower Deschutes sub-basin observed among prehistoric sites is also present among the historic sites, although the pattern is not nearly as clear.

John Day Sub-basins

Six sub-basins are defined within the John Day Basin (Figure 4.2). No sites were recorded in the Middle Fork sub-basin, and the Upper Mainstem and the North and South Fork sub-basins have only a minimal number of sites recorded (Table 4.4). Consequently, the focus of the site distributional analyses will be on the Lower and Middle Mainstem sub-basins. There are clear differences in the distribution of sites between these two sub-basins; prehistoric artifact scatters only represent 19.3% of the sites within the Lower sub-basin, but comprise 76.7% of the sites in the Middle Mainstem. Conversely, prehistoric open sites are the most frequent site type in the Lower sub-basin (48.9%), but only represent 5.6% of the sites in the Middle Mainstem sub-basin. Shelters/caves and quarry sites are also more prevalent in the Lower sub-basin than the Middle Mainstem sub-basin. Interestingly, the only two prehistoric sites recorded in the Upper Mainstem sub-basin are both rock art sites. As seen in the Deschutes Basin, the frequency of site types is more evenly distributed in the Lower sub-basin than in the Middle Mainstem sub-basin.

Similar to the distribution of prehistoric sites, historic artifact scatters are relatively more frequent in the Middle Mainstem sub-basin than in the Lower sub-basin (40.0% to 20.0%). Architectural structure sites are remarkably equally common in both sub-basins, while engineering structures are also nearly equally well represented. Historic burial, historic rock feature, shelters/cave, and historic "other" site types are all more frequent in the Lower sub-basin than Middle Mainstem sub-basin.

Table 4.4. Relative Frequency of Prehistoric and Historic Site Types by John Day River Sub-basins. (Numbers in parentheses are percentages.)

PREHISTORIC

Sub-basin	Arch. Struct.	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
Lower	0 (0.0)	17 (19.3)	0 (0.0)	0 (0.0)	43 (48.9)	0 (0.0)	5 (5.7)	2 (2.3)	2 (2.3)	19 (21.6)	88 (100.0)
Middle Mainstem	0 (0.0)	69 (76.7)	0 (0.0)	0 (0.0)	5 (5.6)	1 (1.1)	1 (1.1)	4 (4.4)	3 (3.3)	7 (7.8)	90 (100.0)
Upper Mainstem	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2 (100.0)
South Fork	0 (0.0)	6 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (100.0)
North Fork	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Middle Fork	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
TOTAL	0 (0.0)	92 (49.5)	0 (0.0)	0 (0.0)	48 (25.8)	1 (0.5)	6 (3.2)	8 (4.3)	5 (2.7)	26 (14.0)	186 (100.0)

HISTORIC

Sub-basin	Arch. Structure	Artifact Scatter	Burial	Eng. Struct.	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
Lower	7 (35.0)	4 (20.0)	1 (5.0)	3 (15.0)	0 (0.0)	2 (10.0)	2 (10.0)	1 (5.0)	20 (100.0)
Mid. Mainstem	12 (34.3)	14 (40.0)	0 (0.0)	7 (20.0)	1 (2.9)	1 (2.9)	0 (0.0)	0 (0.0)	35 (100.0)
Upper Mainstem	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
South Fork	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
North Fork	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Middle Fork	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
TOTAL	20 (33.9)	21 (35.6)	1 (1.7)	10 (16.9)	1 (1.7)	3 (5.1)	2 (3.4)	1 (1.7)	59 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. Struct. = Engineering Structure; Mid. = Middle

Inter-basin comparisons by sub-basin (Tables 4.2, 4.3, and 4.4) reveal interesting similarities and differences. The Lower Deschutes and Lower John Day sub-basins have certain affinities, particularly in the relative infrequency of prehistoric artifact scatters when compared to the other sub-basins. This relative infrequency translates directly into the overall distribution pattern noted for the Lower Deschutes sub-basin, which is a more even distribution of site type frequencies in the lower sub-basins than the other sub-basins. However, this pattern is not as clear in the Lower John Day sub-basin, largely because the relatively fewer artifact scatter sites are offset by relatively more prehistoric open sites, which are much more common in the Lower John Day sub-basin (49.9%) than in the Lower Deschutes sub-basin (27.8%). In both the John Day and Deschutes lower sub-basins, the prehistoric open sites are the most common site type, and are much more frequent than in the other sub-basins. One major difference is that rock feature sites are much more prevalent in the Lower Deschutes sub-basin than in the Lower John Day sub-basin. The middle sub-basins in both basins, as well as the Goose-Summer Lakes Basin, have remarkably similar frequencies of prehistoric artifact scatters: more than the lower sub-basins, but less than the sub-basins farther upstream. The greatest diversity of site types is present in the Upper Crooked sub-basin, with eight different site types recorded. This is followed by the Middle Mainstem and Lower Deschutes sub-basins (with seven different site types), and the Lower John Day sub-basin, with six different site types.

The distribution of prehistoric site types can be generalized as follows. The lower sub-basins have a much higher frequency of open sites (and, in the case of the Deschutes Basin, midden sites) in relation to artifact scatters, which tend to increase in relative frequency with increasing distance from the Columbia River. The shelters/cave site type is likewise more frequent in the two lower sub-basins of each basin. Quarry sites are more frequent in the lower sub-basins than in the upper sub-basins, although this site type is more frequent in the Goose-Summer Lakes Basin than either the Deschutes or John Day Basins. Rock feature sites are much more common in the Lower Deschutes sub-basin than elsewhere.

Some interpretations of the patterns apparent in the data are possible at this point. The higher proportions of open sites relative to artifact scatter sites (and other types) in the lower reaches of both the John Day and Deschutes rivers probably reflect real (as opposed to sample-related) patterns of land use. Open sites reflect concentrated long-term use along the rivers, where a wide range of both aquatic (particularly salmon) and terrestrial resources is available, and the weather, particularly the snow and wind in the winter, is ameliorated. As discussed in Chapter 3, housepit sites on the lower reaches also may reflect intensive use of the salmon resource. The same pattern may be true for shelters/cave sites, but these sites apparently are found along the lower stretches of the rivers because this is where the canyons (and thus the landforms suitable for rock overhangs) are located. Conversely, artifact scatters are probably situated in proximity to specific resources, and are dispersed in a manner reflecting the distribution of these resources. Rock feature sites, like shelters/cave sites, are probably more frequent in the lower reaches of the Deschutes Basin because they are linked to specific topographic features (such as talus fields in canyons). As mentioned earlier, the presence of midden sites in the Deschutes Basin, and their absence in the John Day Basin, is an interesting phenomenon, perhaps relating to the better shellfish habitat in one river than the other. Clearly, the Deschutes River has a larger, more stable flow than the John Day River, and thus may be better able to support a shellfish population. The same can be said for the variance between the upper and lower reaches of the Deschutes River; the upper reaches have less volume, and are more subject to seasonal fluctuations. In the John Day and Deschutes basins, the higher incidence of quarry sites in the lower reaches is probably due to the presence of the Clarno Formation (containing deposits of CCS) in the Columbia Basin Province. The relatively higher proportion of quarry sites in the Goose-Summer Lakes Basin is due to Glass Buttes (Mack 1975). The evenness of site-type frequency in the lower sub-basins appears to be a real reflection of cultural land-use patterning. The lower sub-basins have better weather and more substantial salmon resources available, and a correspondingly greater range of site types dominated by open sites with housepits.

Inter-basin comparisons of historic sites by sub-basin also reveals some interesting patterns. Artifact scatters are the most frequent sites in each sub-basin, with the exception of the Lower John Day sub-basin, and there is a clear tendency for the lower sub-basins to have relatively fewer artifact scatters. Reasons for this tendency are unclear. One possible explanation is that historic artifact scatter sites are a reflection of the Euro-American "throw-away" society, and the relative inaccessibility of the lower canyons limits refuse disposal. As discussed earlier for the individual basins, architectural structure sites are much more common in the John Day basin than in the other basins, although this is probably an artifact of sampling bias. Engineering structures tend to be relatively more common in the lower reaches of the Deschutes and John Day river basins, although this trend certainly is reversed in the Upper Deschutes sub-basin. Again, the reasons for this distributional pattern are unclear. The remaining historic site types show little patterning.

Elevation

Another variable by which we can examine site distributions is elevation (Table 4.5), with very interesting results. For prehistoric sites, there exists a clear inverse relationship between artifact scatters and both open sites and shelters/caves; artifact scatter sites are relatively infrequent at the lower elevations, but increase in frequency with elevation. Correspondingly, both open sites and shelters/cave sites have an overall pattern of decreasing frequency as elevation increases. Midden sites, found entirely within the Deschutes Basin and mostly in the Lower Deschutes sub-basin, follow a similar pattern; the majority of these sites are in the lowest elevational interval. These distributional patterns are obviously related to the physiographic setting of the site types discussed above. Artifact scatters, however, are not linked as closely to these settings, and thus are found in greater proportions at higher elevations. Quarry sites are found at all elevational intervals except the lowest and highest, with the greatest frequency between 1000 and 1999 ft. (305-609 m), and from that point decrease in frequency as elevation increases. Similarly, rock art sites are found at all but the highest and lowest elevational intervals, but the highest frequency is between 2000 and 2999 ft. (610-914 m). Rock feature sites follow no such pattern; this site type is most frequent between 2000 and 2999 ft. (610-914 m).

Elevation-related patterns are not as clear among the historic sites. Historic artifact scatters are the most common sites in all but the lowest elevational interval, where architectural structures and "other" are the most prevalent types. The highest relative incidence of architectural structures is found between 1000 to 1999 ft. (305-609 m), with a general tendency for this site type to decrease in frequency with increasing elevation. Artifact scatters are most common between 4000 and 4999 ft. (1219-1524 m), but all elevational intervals (with the exception of the lowest) are not significantly different in this regard. Engineering structures are most frequent between 3000 and 3999 ft. (914-1219 m), while the "other" site type is most common at the lowest elevational interval; neither of these types appear to have any correlation with elevation.

Table 4.5. Relative Frequency of Prehistoric and Historic Site Types by 1000 Foot Elevation Intervals. (Numbers in parentheses are percentages.)

PREHISTORIC

Elevational Interval	Arch. Struct.	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
0-999	0 (0.0)	5 (10.6)	0 (0.0)	3 (6.4)	24 (51.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	15 (31.9)	47 (100.0)
1000-1999	0 (0.0)	30 (40.0)	0 (0.0)	1 (1.3)	25 (33.3)	0 (0.0)	5 (6.7)	2 (2.7)	2 (2.7)	10 (13.3)	75 (100.0)
2000-2999	0 (0.0)	25 (61.0)	0 (0.0)	1 (2.4)	2 (4.9)	1 (2.4)	1 (2.4)	3 (7.3)	2 (4.9)	6 (14.6)	41 (100.0)
3000-3999	0 (0.0)	63 (88.7)	1 (1.4)	0 (0.0)	0 (0.0)	2 (2.8)	1 (1.4)	1 (1.4)	0 (0.0)	3 (4.2)	71 (100.0)
4000-4999	1 (0.5)	208 (95.4)	0 (0.0)	0 (0.0)	3 (1.4)	0 (0.0)	1 (0.5)	1 (0.5)	2 (0.9)	2 (0.9)	218 (100.0)
5000-5999	0 (0.0)	6 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (100.0)
None	0 (0.0)	134 (48.7)	0 (0.0)	27 (9.8)	42 (15.3)	0 (0.0)	13 (4.7)	11 (4.0)	20 (7.3)	28 (10.2)	275 (100.0)
TOTAL	1 (0.1)	471 (64.3)	1 (0.1)	32 (4.4)	96 (13.1)	3 (0.4)	21 (2.9)	18 (2.5)	26 (3.5)	64 (8.7)	733 (100.0)

HISTORIC

Elevational Interval	Arch. Structure	Artifact Scatter	Burial	Eng. Structure	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
0-999	3 (25.0)	1 (8.3)	1 (8.3)	1 (8.3)	0 (0.0)	3 (25.0)	2 (16.7)	1 (8.3)	12 (100.0)
1000-1999	3 (37.5)	4 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (12.5)	0 (0.0)	0 (0.0)	8 (100.0)
2000-2999	5 (31.3)	9 (56.3)	0 (0.0)	1 (6.3)	1 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	16 (100.0)
3000-3999	5 (11.9)	23 (54.8)	1 (2.4)	6 (14.3)	0 (0.0)	6 (14.3)	1 (2.4)	0 (0.0)	42 (100.0)
4000-4999	9 (14.3)	40 (63.5)	0 (0.0)	7 (11.1)	1 (1.6)	5 (7.9)	0 (0.0)	1 (1.6)	63 (100.0)
5000-5999	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
None	5 (17.9)	9 (32.1)	0 (0.0)	9 (32.1)	0 (0.0)	3 (10.7)	2 (7.1)	0 (0.0)	28 (100.0)
TOTAL	31 (18.1)	87 (50.9)	2 (1.2)	24 (14.0)	2 (1.2)	18 (10.5)	5 (2.9)	2 (1.2)	171 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. = Engineering; None = No Elevation Recorded

Plant Communities

The distribution of sites by site type and plant community is presented in Table 4.6. These province-specific plant communities were derived during data entry by correlating the vegetation listed on the site forms with the plant community elements listed in the Oregon Natural Heritage Plan (Natural Heritage Advisory Council 1988).

Table 4.6. Relative Frequency of Prehistoric and Historic Site Types by Plant Communities. (Numbers in parentheses are percentages.)

PREHISTORIC

Plant Comm.	Arch. Struct	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
Douglas Fir Zone	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Grassland	0 (0.0)	7 (25.9)	0 (0.0)	7 (25.9)	4 (14.8)	0 (0.0)	3 (11.1)	1 (3.7)	3 (11.1)	2 (7.4)	27 (100.0)
Grassland/ Shrubland	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Lodgepole Pine Zone	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
P. Pine/ W. Juniper	0 (0.0)	127 (76.0)	0 (0.0)	2 (1.2)	13 (7.8)	2 (1.2)	3 (1.8)	5 (3.0)	3 (1.8)	12 (7.2)	167 (100.0)
P. Pine	0 (0.0)	23 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	23 (100.0)
Shrub	0 (0.0)	203 (54.0)	0 (0.0)	22 (5.9)	78 (20.7)	0 (0.0)	14 (3.7)	4 (1.1)	14 (3.7)	41 (10.9)	376 (100.0)
Shrub-Grass	0 (0.0)	19 (86.4)	1 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (9.1)	0 (0.0)	22 (100.0)
Special Types	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
W. Juniper Zone	1 (1.1)	87 (94.6)	0 (0.0)	0 (0.0)	1 (1.1)	1 (1.1)	1 (1.1)	0 (0.0)	0 (0.0)	1 (1.1)	92 (100.0)
None or Other	0 (0.0)	2 (8.7)	0 (0.0)	1 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)	8 (34.8)	4 (17.4)	8 (34.8)	27 (100.0)
TOTAL	1 (0.1)	471 (64.3)	1 (0.1)	32 (4.4)	96 (13.1)	3 (0.4)	21 (2.9)	18 (2.5)	26 (3.5)	64 (8.7)	733 (100.0)

HISTORIC

Plant Community	Arch. Structure	Artifact Scatter	Burial	Eng. Structure	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
Douglas Fir Zone	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
Grassland	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	2 (100.0)
Grassland/Shrubland	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Lodgepole Pine Zone	4 (18.2)	14 (63.6)	0 (0.0)	3 (13.6)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	22 (100.0)
P. Pine/W. Juniper	12 (22.2)	27 (50.0)	2 (3.7)	6 (11.1)	0 (0.0)	7 (13.0)	0 (0.0)	0 (0.0)	54 (100.0)
Ponderosa Pine	0 (0.0)	4 (40.0)	0 (0.0)	4 (40.0)	0 (0.0)	2 (20.0)	0 (0.0)	0 (0.0)	10 (100.0)
Shrub	7 (14.6)	26 (54.2)	0 (0.0)	4 (8.3)	2 (4.2)	4 (8.3)	3 (6.3)	2 (4.2)	48 (100.0)
Shrub-Grass	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
Special Types	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
W. Juniper Zone	5 (29.4)	8 (47.1)	0 (0.0)	1 (5.9)	0 (0.0)	2 (11.8)	1 (5.9)	0 (0.0)	17 (100.0)
None or Other	0 (0.0)	4 (36.4)	0 (0.0)	6 (54.5)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)	11 (100.0)
TOTAL	31 (18.1)	87 (50.9)	2 (1.2)	24 (14.0)	2 (1.2)	18 (10.5)	5 (2.9)	2 (1.2)	171 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. = Engineering; P. Pine/W. Juniper = Ponderosa Pine and Western Juniper; Comm. = Community.

As can be seen in Table 4.6, prehistoric artifact scatters are present in all the plant communities except the Douglas Fir Zone, Grassland/shrubland, and Special types (for all of which no sites exist), but the frequencies vary considerably. In the Grassland community, artifact scatters represent only 25.9% of the sites, while at the opposite end of the scale this site type is the only type (100%) found in the Ponderosa Pine Zone. Midden sites (along with artifact scatters) are the most frequent type in the Grassland community (25.9%), while opensites represent 14.8% of the sites in this community. Artifact scatter sites (76.0%) are predominant in the Ponderosa Pine and Western Juniper community, with open sites (7.8%) next in relative frequency. In the Western Juniper community, artifact scatters (94.6%) represent, by far, the majority site type; no other type has more than a single site (1.1%) in this community. In the Shrub community, however, artifact scatters are relatively less dominant (54.0%), and open sites (20.7%) comprise a relatively higher proportion. The Grassland community is interesting in that, although there are relatively few sites recorded in this community (27), it has the most evenly distributed frequency of site types, and a great diversity of site types, with seven different site types represented. The plant community with the largest number of different site types is the Ponderosa Pine and Western Juniper community (the latter has one of the highest populations), with eight different site types.

The distributional patterns observed here probably reflect elevation. The Grassland, Shrub, and Shrub-Grassland communities are all prevalent in the lower elevations, and thus are proportionately more frequently associated with the midden, shelters/cave, and open sites. Artifact scatters, conversely, are also located at higher elevations, and thus are associated with the plant communities containing trees.

All but the Grassland community have historic artifact scatters, but the frequency of this site type in those communities where it is present ranges from 33.3% in the Douglas Fir Zone to 100.0% in the Grassland/shrubland and Special Types communities. The historic artifact scatter site type is the most common type in all plant communities except the Douglas Fir Zone, the Grassland community, and the Shrub-grassland community. The greatest diversity of historic site types is within the Shrub community, where seven different site types are represented.

Primary Landforms

Perhaps the most useful variable with which to examine site distributions is landforms. We will present the distribution of sites by landform at two different scales: primary landform, which is the dominant landform (the "big picture," so to speak), and secondary landform, which is the immediate setting of the site. The landforms used here were derived from the data entry manual (Bureau of Land Management 1989b:4-6).

Cultural resource sites are associated with nine different primary landforms (Table 4.7). Prehistoric artifact scatter sites were recorded on all of the landforms, and are the predominant type on each landform (which is not surprising, given the sample size). However, this site type is not nearly as dominant in canyons (35.0%) as it is elsewhere; open sites (26.1%) and shelters/cave sites (18.2%) are correspondingly more frequent in this setting (with a single exception, all of the shelters/cave sites with landform recorded as an attribute

Table 4.7. Relative Frequency of Prehistoric and Historic Site Types by Primary Landform. (Numbers in parentheses are percentages.)

PREHISTORIC

Primary Landform	Arch. Struct	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
None	0 (0.0)	189 (84.0)	0 (0.0)	12 (5.3)	7 (3.1)	0 (0.0)	4 (1.8)	2 (0.9)	5 (2.2)	6 (2.7)	225 (100.0)
Badlands	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
Butte	1 (20.0)	4 (80.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)
Canyon	0 (0.0)	110 (35.0)	0 (0.0)	20 (6.4)	82 (26.1)	0 (0.0)	13 (4.1)	13 (4.1)	19 (6.1)	57 (18.2)	314 (100.0)
Flat Plains	0 (0.0)	14 (82.4)	0 (0.0)	0 (0.0)	2 (11.8)	1 (5.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	17 (100.0)
Hill	0 (0.0)	29 (90.6)	0 (0.0)	0 (0.0)	1 (3.1)	1 (3.1)	0 (0.0)	1 (3.1)	0 (0.0)	0 (0.0)	32 (100.0)
Mesa	0 (0.0)	4 (66.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (16.7)	1 (16.7)	0 (0.0)	6 (100.0)
Mountain	0 (0.0)	6 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (100.0)
Rolling Plains	0 (0.0)	110 (90.9)	0 (0.0)	0 (0.0)	4 (3.3)	0 (0.0)	4 (3.3)	1 (0.8)	1 (0.8)	1 (0.8)	121 (100.0)
Valley	0 (0.0)	4 (80.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)
TOTAL	1 (0.1)	471 (64.3)	1 (0.1)	32 (4.4)	96 (13.1)	3 (0.4)	21 (2.9)	18 (2.5)	26 (3.5)	64 (8.7)	733 (100.0)

HISTORIC

Primary Landform	Arch. Structure	Artifact Scatter	Burial	Eng. Structure	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
None	11 (19.3)	34 (59.6)	1 (1.8)	6 (10.5)	1 (1.8)	4 (7.0)	0 (0.0)	0 (0.0)	57 (100.0)
Badlands	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Butte	1 (20.0)	4 (80.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)
Canyon	18 (25.4)	23 (32.4)	1 (1.4)	13 (18.3)	1 (1.4)	9 (12.7)	5 (7.0)	1 (1.4)	71 (100.0)
Flat Plains	1 (5.9)	12 (70.6)	0 (0.0)	3 (17.6)	0 (0.0)	1 (5.9)	0 (0.0)	0 (0.0)	17 (100.0)
Hill	0 (0.0)	8 (66.7)	0 (0.0)	1 (8.3)	0 (0.0)	3 (25.0)	0 (0.0)	0 (0.0)	12 (100.0)
Mesa	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Mountain	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Rolling Plains	0 (0.0)	2 (66.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	3 (100.0)
Valley	0 (0.0)	4 (66.7)	0 (0.0)	1 (16.7)	0 (0.0)	1 (16.7)	0 (0.0)	0 (0.0)	6 (100.0)
TOTAL	31 (18.1)	87 (50.9)	2 (1.2)	24 (14.0)	2 (1.2)	18 (10.5)	5 (2.9)	2 (1.2)	171 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. = Engineering; None = No Landform Recorded

---

are linked with canyons). After canyons, open sites are most commonly associated with flat plains (11.8%). All of the midden sites (among those with the primary landform recorded as an attribute) are associated with canyons. It is clear that canyons are the primary locations of middens, open sites, and shelters/cave sites. Canyons are related to more site types (seven) than any other landform (probably because this landform is very common within the Prineville District). Although the sample size is small, it is interesting to note that the only sitetype associated with mountains is the artifact scatter (100.0%); conversely, mesas have relatively fewer artifact scatters (66.7%) and a higher proportion of rock art (16.7%) and rock feature sites (16.7%).

Historic sites were documented on six different primary landforms (Table 4.7). The strong association with canyons continues into the historic period, although, as with prehistoric sites, the historic artifact scatter is less dominant in the canyons (32.4%) than on other landforms. Architectural structure (25.4%), engineering structures (18.3%), and historic rock feature sites (7.0%) are relatively more frequent in canyons than elsewhere. Engineering structures are relatively equally represented in canyons (18.3%), flat plains (17.6%), and valleys (16.7%). The "other" site type is most commonly linked with hills (25.0%), followed by canyons (12.7%).

Secondary Landforms

The diversity of secondary landforms is much greater than that of primary landforms, and cultural resource sites are associated with 20 different secondary landforms (Table 4.8). Prehistoric artifact scatters are recorded on 17 of these landforms, and are the only site type recorded in association with alluvial fans, lakes, marshes, meadows, and playas (sample size could be a critical factor here, as few sites link to any of these landforms). Artifact scatter sites are also clearly the predominant type associated with intermittent streams (90.8%), hills (86.7%), ridges (83.3%), springs (80.0%), and slopes (73.0%). Midden sites have the strongest correlation with rivers (52.8%) of any site type, and are also frequently found on terraces (8.9%). Open sites are the predominant type on terraces (44.7%) and swales (80.0%), and have the second highest relative frequency on benches (26.8%), and along rivers (16.7). Quarry sites are associated with a variety of landforms, and are most commonly related to springs (20.0%), slopes (8.1%), and ridges (7.4%). Bluffs (33.3%), cliffs (17.0%), and rimrock (16.7%) are the most common settings for rock art sites, while rock feature sites predominate on talus fields (72.0%). Shelters/cave sites are the most frequent type connected with bluffs (66.7%) and cliffs (49.1%), with a relatively high correlation with rimrock (33.3%); this site type is found in association with a wide range of landforms (11). Benches have the greatest diversity of prehistoric site types (eight), followed by ridges (six).

Table 4.8 also shows that architectural structures are most frequently associated with intermittent streams (31.6%), terraces (30.0%), and benches (30.0%) (including only those landforms with more than five sites total). Like their prehistoric counterparts, historic artifact scatters are found on the greatest variety of landforms (11), and are the only type on alluvial fans, hills, and swales. This site type also is most frequently associated with streams (75.0%), benches (60.0%), floodplains (50.0%), ridges (50.0%), intermittent streams (42.1%), and terraces (43.3%). Engineering structures are most highly related to slopes

Table 4.8. Relative Frequency of Prehistoric and Historic Site Types by Secondary Landform. (Numbers in parentheses are percentages.)

PREHISTORIC

Secondary Landform	Arch. Struct.	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
None	0 (0.0)	124 (87.3)	1 (0.7)	0 (0.0)	4 (2.8)	1 (0.7)	0 (0.0)	3 (2.1)	0 (0.0)	9 (6.3)	142 (100.0)
Alluvial Fan	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
Bench	1 (2.4)	23 (56.1)	0 (0.0)	1 (2.4)	11 (26.8)	0 (0.0)	1 (2.4)	1 (2.4)	1 (2.4)	2 (4.9)	41 (100.0)
Bluff	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	0 (0.0)	2 (66.7)	3 (100.0)
Cliff	0 (0.0)	16 (30.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.9)	9 (17.0)	1 (1.9)	26 (49.1)	53 (100.0)
Flood Plain	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Hill	0 (0.0)	26 (86.7)	0 (0.0)	0 (0.0)	2 (6.7)	0 (0.0)	1 (3.3)	0 (0.0)	0 (0.0)	1 (3.3)	30 (100.0)
Int. Stream	0 (0.0)	69 (90.8)	0 (0.0)	1 (1.3)	3 (3.9)	1 (1.3)	2 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	76 (100.0)
Lake	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
Marsh	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Meadow	0 (0.0)	5 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)
Playa	0 (0.0)	5 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)
Ridge	0 (0.0)	90 (83.3)	0 (0.0)	0 (0.0)	5 (4.6)	0 (0.0)	8 (7.4)	0 (0.0)	4 (3.7)	1 (0.9)	108 (100.0)
Rimrock	0 (0.0)	8 (44.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (16.7)	1 (5.6)	6 (33.3)	18 (100.0)
River	0 (0.0)	6 (16.7)	0 (0.0)	19 (52.8)	6 (16.7)	0 (0.0)	0 (0.0)	1 (2.8)	1 (2.8)	3 (8.3)	36 (100.0)
Slope	0 (0.0)	27 (73.0)	0 (0.0)	0 (0.0)	2 (5.4)	1 (2.7)	3 (8.1)	0 (0.0)	0 (0.0)	4 (10.8)	37 (100.0)
Spring	0 (0.0)	4 (80.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)
Stream	0 (0.0)	12 (80.0)	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (13.3)	15 (100.0)
Swale	0 (0.0)	1 (20.0)	0 (0.0)	0 (0.0)	4 (80.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)
Talus	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (12.0)	0 (0.0)	0 (0.0)	0 (0.0)	18 (72.0)	4 (16.0)	25 (100.0)
Terrace	0 (0.0)	49 (39.8)	0 (0.0)	11 (8.9)	55 (44.7)	0 (0.0)	4 (3.3)	0 (0.0)	0 (0.0)	4 (3.3)	123 (100.0)
TOTAL	1 (0.1)	471 (64.3)	1 (0.1)	32 (4.4)	96 (13.1)	3 (0.4)	21 (2.9)	18 (2.5)	26 (3.5)	64 (8.7)	733 (100.0)

Table 4.8 (Continued).

HISTORIC

Secondary Landform	Arch. Structure	Artifact Scatter	Burial	Eng. Structure	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
None	7 (12.1)	38 (65.5)	1 (1.7)	7 (12.1)	0 (0.0)	4 (6.9)	1 (1.7)	0 (0.0)	58 (100.0)
Alluvial Fan	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Bench	3 (30.0)	6 (60.0)	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	10 (100.0)
Bluff	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)
Cliff	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
Flood Plain	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
Hill	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
Intermittent Stream	6 (31.6)	8 (42.1)	0 (0.0)	0 (0.0)	2 (10.5)	3 (15.8)	0 (0.0)	0 (0.0)	19 (100.0)
Lake	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Marsh	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Meadow	1 (33.3)	2 (66.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
Playa	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Ridge	1 (10.0)	5 (50.0)	0 (0.0)	2 (20.0)	0 (0.0)	0 (0.0)	2 (20.0)	0 (0.0)	10 (100.0)
Rimrock	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
River	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
Slope	0 (0.0)	6 (28.6)	0 (0.0)	8 (38.1)	0 (0.0)	4 (19.0)	2 (9.5)	1 (4.8)	21 (100.0)
Spring	2 (50.0)	1 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (25.0)	0 (0.0)	0 (0.0)	4 (100.0)
Stream	1 (25.0)	3 (75.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (100.0)
Swale	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Talus	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
Terrace	9 (30.0)	13 (43.3)	1 (3.3)	3 (10.0)	0 (0.0)	4 (13.3)	0 (0.0)	0 (0.0)	30 (100.0)
TOTAL	31 (17.9)	87 (50.6)	2 (1.2)	24 (14.3)	2 (1.2)	18 (10.7)	5 (3.0)	2 (1.2)	171 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. = Engineering; Int. = Intermittent

(38.1%). Terraces and slopes, each with five different site types, have the greatest diversity of site types.

Water Source and Distance to Water

Certain site types (such as middens) associate more with water than others. The relationship between cultural resource sites and water is developed further in Tables 4.9 and 4.10, which present the types of water sources associated with site types, and the distance by site type to the nearest water. In addition to providing direct site type-water correlations, these relationships also serve to illustrate the topographic setting by site type (i.e., a site with a river as the recorded water source is probably in a different setting than a site near an intermittent stream).

Intermittent streams clearly are associated with the greatest diversity of prehistoric site types (and have the largest population), with at least one site of each type noted. Artifact scatter sites are clearly dominant in this regard (86.7%), with shelters/cave sites (4.0%) the next in frequency. Artifact scatter sites are the only type associated with intermittent springs, lakes, and seeps (almost certainly due to sample size), and, in addition to intermittent streams, are the predominant type associated with intermittent lakes (91.5%), reservoirs (90.9%), springs (78.6%), and streams (78.2%). (Prehistoric sites were listed in association with reservoirs in the database because of the belief that a water source must have been present in order to develop the reservoir.) Midden sites are almost exclusively associated with rivers (12.5%), and only a single such site relates to a different water source. Open sites (33.1%) are the most frequent type related to rivers. Springs (10.7%), intermittent streams (3.3%), and rivers (3.2%) are the types of water associated with quarry sites; rock art (4.0%), rock feature (7.7%), and shelters/cave (17.7%) sites are more frequently found near rivers than elsewhere.

Historic artifact scatter sites are the only historic type found in association with intermittent lakes, and are the predominant type associated with intermittent streams (64.6%), streams (44.0%), and rivers (43.5%). Architectural structure sites are the most common site type near springs (33.3%), and are the second most frequent type associated with rivers (22.6%) and intermittent streams (13.8%). Engineering structures are the predominant type related to canals (60.0%), which is not surprising, as canals are included in the type definition. This type is second to the most frequent type linked to streams (28.0%).

The mean distances to water serve to emphasize some of the site-type associations presented above. Among prehistoric site types, midden sites have the shortest average distance to water (7.5 m), followed by rock art sites (26.4 m) (Table 4.10). Prehistoric open sites and shelters/cave sites also are relatively close to water. As discussed above, all of these sites types are most frequently associated with rivers, and the distances to water would seem to indicate that proximity to water is an important consideration in site location. Rock feature sites also are most frequently linked to rivers, but the relatively large average distance to water would seem to indicate that water availability is not a major consideration in site location. While the "other" site type has by far the greatest average distance to water

Table 4.9. Relative Frequency of Prehistoric and Historic Site Types by Water Source. (Numbers in parentheses are percentages.)

PREHISTORIC

Water Source	Arch. Struct	Artifact Scatter	Isolate	Midden	Open Site	Other	Quarry	Rock Art	Rock Feature	Shelters/ Cave	*TOTAL*
Unknown	0 (0.0)	37 (92.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (5.0)	0 (0.0)	1 (2.5)	40 (100.0)
Canal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Int. Lake	0 (0.0)	43 (91.5)	0 (0.0)	0 (0.0)	2 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.3)	0 (0.0)	47 (100.0)
Int. Spring	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Int. Stream	1 (0.3)	260 (86.7)	1 (0.3)	1 (0.3)	8 (2.7)	1 (0.3)	10 (3.3)	5 (1.7)	1 (0.3)	12 (4.0)	300 (100.0)
Lake	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
None	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Reservoir	0 (0.0)	10 (90.9)	0 (0.0)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	11 (100.0)
River	0 (0.0)	52 (21.0)	0 (0.0)	31 (12.5)	82 (33.1)	2 (0.8)	8 (3.2)	10 (4.0)	19 (7.7)	44 (17.7)	248 (100.0)
Seeps	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Spring	0 (0.0)	22 (78.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (10.7)	0 (0.0)	1 (3.6)	2 (7.1)	28 (100.0)
Stream	0 (0.0)	43 (78.2)	0 (0.0)	0 (0.0)	3 (5.5)	0 (0.0)	0 (0.0)	1 (1.8)	3 (5.5)	5 (9.1)	55 (100.0)
TOTAL	1 (0.1)	471 (64.3)	1 (0.1)	32 (4.4)	96 (13.1)	3 (0.4)	21 (2.9)	18 (2.5)	26 (3.5)	64 (8.7)	733 (100.0)

HISTORIC

Water Source	Arch. Structure	Artifact Scatter	Burial	Eng. Structure	Open Site	Other	Rock Feature	Shelters/ Cave	*TOTAL*
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Canal	0 (0.0)	1 (20.0)	0 (0.0)	3 (60.0)	0 (0.0)	1 (20.0)	0 (0.0)	0 (0.0)	5 (100.0)
Intermittent Lake	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
Intermittent Spring	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Intermittent Stream	9 (13.8)	42 (64.6)	0 (0.0)	3 (4.6)	2 (3.1)	6 (9.2)	2 (3.1)	1 (1.5)	65 (100.0)
Lake	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
None	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
Reservoir	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
River	14 (22.6)	27 (43.5)	1 (1.6)	10 (16.1)	0 (0.0)	8 (12.9)	2 (3.2)	0 (0.0)	62 (100.0)
Seeps	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (100.0)
Spring	2 (33.3)	2 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	2 (33.3)	0 (0.0)	0 (0.0)	6 (100.0)
Stream	4 (16.0)	11 (44.0)	0 (0.0)	7 (28.0)	0 (0.0)	1 (4.0)	1 (4.0)	1 (4.0)	25 (100.0)
TOTAL	31 (18.1)	87 (50.9)	2 (1.2)	24 (14.0)	2 (1.2)	18 (10.5)	5 (2.9)	2 (1.2)	171 (100.0)

Key: Arch. Struct. = Architectural Structure; Eng. = Engineering; Int. = Intermittent

Table 4.10. Mean Distance (in meters) to Water by Prehistoric and Historic Site Type (Excludes those sites for which the distance to water is unknown; numbers in parentheses are percentages.)

Site Type	Historic (n)	Prehistoric (n)
Architectural Structure	234.7 (27)	204.0 (1)
Artifact Scatter	698.0 (72)	254.4 (362)
Burial	22.0 (1)	--
Engineering Structure	248.6 (23)	--
Isolate	--	200.0 (1)
Midden	--	7.5 (32)
Open Site	1.0 (2)	81.9 (87)
Other	767.6 (15)	1399.3 (3)
Quarry	--	169.8 (19)
Rock Art	--	26.4 (11)
Rock Feature	55.0 (4)	215.1 (23)
Shelters/Cave	--	99.8 (53)
All Sites	514.4 (144)	199.0 (592)

(1399.3 m), the artifact scatter sites have the second-greatest (254.4 m). This particular site type also has the greatest diversity of types of water sources, suggesting that proximity to, and type of, water was not as important during use of these sites as for most other site types.

For historic sites, the open site type has the shortest average distance to water (1.0 m), indicating that both of the sites in this type are on the edge of the water source (Table 4.10). The single burial site with distance to water recorded is also close to water (22.0 m), as are the rock feature sites (55.0 m). Somewhat surprising is the distance to water for architectural structures (234.7 m), which we would have expected to be more closely associated with water. Artifact scatters apparently have little correlation with proximity to water, as the average distance between this site type and water is nearly half of a mile (698.0 m).

Relationships are apparent between certain site types and specific settings, and, conversely, some site types do not appear to have such relationships. The best associations are with midden sites, which are always in canyons, on alluvial topographic features, and near water (usually a river). This is hardly a startling revelation. These are resource-specific sites in direct proximity to the resource (shellfish). Prehistoric open sites and shelters/cave sites also correlate well with specific settings. Open sites are usually in canyons, on terraces or benches relatively close to a river. As discussed earlier, these probably are locations used for extended habitation, and this setting provides access to both terrestrial and aquatic resources (and potable water), as well as favorable weather conditions. Shelters/cave sites also are normally within canyons, and most frequently are associated with cliffs and rimrock relatively near a river. The locations of these sites is probably as much a function of available landforms (overhangs) as a purposeful land-use decision. Talus slopes within canyons are the most frequent setting for prehistoric rock feature sites, with rivers in the vicinity, but not necessarily in close proximity. The strong association of rock feature sites with talus slopes is problematic, and probably is due to the high incidence of talus slope features reported by Hibbs et al. (1976). Clearly, these sites must be related to landforms to some degree (i.e., rocks are a necessary prerequisite). Rock art sites, normally found within canyons, correlate well with cliffs and rimrock, and usually are very near water. Canyons also provide the most frequent background setting for quarry sites, which correlate poorly with secondary landforms. In this regard, quarry sites are more likely related to raw material sources than to specific landforms or water sources. Prehistoric artifact scatters are the most common site type, but have the poorest relationship with specific settings, and are associated with 17 different secondary landforms. As mentioned previously, artifact scatters undoubtedly encompass a variety of purposes, and thus would not correlate well with specific settings. The remaining prehistoric site types are too rare to discern distributional patterns.

The degree of site-type associations with setting among the historic sites is lower than among the prehistoric sites. Like their prehistoric counterparts (and for the same reasons), historic artifact scatters lack setting specificity, particularly in relation to water. Architectural structures usually are within canyons, but on a variety of secondary landforms, and relatively distant from water. Engineering structures also are related usually to canyons, and are found most frequently on the slopes at a relatively great distance from water. Also most frequently found in canyons are sites of the "other" type, which bear little relationship to specific secondary settings. The infrequent nature of the remaining historic site types prohibits determination of distributional patterns.

Historic sites evidently are associated with canyons more frequently than other landforms, probably because canyons are very frequent in the Prineville District. The relative lack of patterning, when compared to prehistoric sites, is probably a function of environmental manipulation. Water distribution and redistribution, in particular, has greatly influenced Euro-American land use. The relative lack of a water source near architectural structure sites is probably because wells or ditches brought water to the site; this factor negates the necessity of locating habitation sites near potable water, and thus these sites are situated on a variety of landforms. Engineering structures, including ditches and canals, are most frequently on slopes because a constant slope is necessary to transport water.

Aspect and Slope

The two remaining environmental variables are aspect and slope. Unfortunately, neither of these variables was consistently noted during site recordation, so the sample of sites is rather small (206 sites with aspect recorded, 137 sites for slope). Nevertheless, site distribution patterns may exist, so examining these variables is a worthy endeavor. However, subdividing the sample into units so small that patterns cannot be apparent is impractical, so neither variable is examined by site type, and slope is examined only for the study area as a whole.

Table 4.11 presents the distribution of sites with aspect recorded by basin, sub-basin, and aspect. Sites with a southern aspect are most frequent in all basins, including two (40.0%) of the five sub-basins in the Deschutes basin, and two (66.7%) of the three of the sub-basins in the John Day basin (among those sub-basins with sites for which aspect was recorded).

Table 4.11. Frequency of Prehistoric and Historic Site Types by Aspect and Sub-basin. (Numbers in parentheses are percentages.)

DESCHUTES BASIN

Aspect	Lower Deschutes	Middle Deschutes	Upper Deschutes	Lower Crooked	Upper Crooked	*TOTAL*
North	4 (18.2)	1 (10.0)	2 (100.0)	4 (33.3)	18 (22.2)	29 (22.8)
East	5 (22.7)	6 (60.0)	0 (0.0)	3 (25.0)	17 (21.0)	31 (24.4)
South	10 (45.5)	2 (20.0)	0 (0.0)	1 (8.3)	32 (39.5)	45 (35.4)
West	3 (13.6)	1 (10.0)	0 (0.0)	4 (33.3)	14 (17.3)	22 (17.3)
TOTAL	22 (100.0)	10 (100.0)	2 (100.0)	12 (100.0)	81 (100.0)	127 (100.0)

JOHN DAY BASIN

Aspect	Lower	Middle Mainstem	Upper Mainstem	North Fork	South Fork	*TOTAL*
North	7 (24.1)	11 (25.0)	1 (100.0)	0 (0.0)	0 (0.0)	19 (25.7)
East	4 (13.8)	13 (29.5)	0 (0.0)	0 (0.0)	0 (0.0)	17 (23.0)
South	11 (37.9)	14 (31.8)	0 (0.0)	0 (0.0)	0 (0.0)	25 (33.8)
West	7 (24.1)	6 (13.6)	0 (0.0)	0 (0.0)	0 (0.0)	13 (17.6)
TOTAL	29 (100.0)	44 (100.0)	1 (100.0)	0 (0.0)	0 (0.0)	74 (100.0)

GOOSE/SUMMER

Aspect	Frequency
North	1 (20.0)
East	0 (0.0)
South	3 (60.0)
West	1 (20.0)
TOTAL	5 (100.0)

The least common aspect is west. When only those sub-basins with more than one aspect recorded are considered, west is the lowest-frequency aspect in three of the four (75.0%) sub-basins in the Deschutes basin, and has the lowest frequency in one of the two (50.0%) sites in the John Day basin.

The frequency of sites in slope intervals of 10% is presented in Table 4.12. As would be expected, the highest frequency of sites is in the lowest slope interval (below 10%), with site frequency decreasing as slope increases. None of the sites (among those with slope recorded) were on slopes exceeding 60%.

Table 4.12. Frequency of Prehistoric and Historic Site Types by Slope.

Slope (%)	Number of Sites (%)
< 10	83 (60.6)
10 - 19	28 (20.4)
20 - 29	10 (7.3)
30 - 39	8 (5.8)
40 - 49	4 (2.9)
≥ 50	4 (2.9)
TOTAL	137 (99.9)

FREQUENCY OF SITES WITH SHELL, GROUND STONE ARTIFACTS, AND ROCK ART

After determining that midden sites were present only in the Deschutes Basin, we thought it might prove beneficial to examine the distribution of shell within prehistoric sites. While these cultural remains are not direct environmental variables, the presence of these artifacts in certain locations may well be directly related to the environment. In addition, we also examined the database to determine the distribution of ground stone artifacts, and the distribution of pictographs versus petroglyphs. As can be seen in Table 4.13, shell was observed in sites in both the Deschutes and John Day basins, although the frequency is much higher in the Deschutes basin (15.3% of the sites) than in the John Day basin (5.4% of the sites). Within the Deschutes basin, the Lower Deschutes sub-basin certainly has the highest frequency of sites with shell (48.5%), compared to 9.1% of the sites in the Lower sub-basin of the John Day basin. In both basins, a general trend exists for decreasing presence of shell with increasing distance from the Columbia River, although it is interesting to note that the Lower Crooked River sub-basin does have one site with shell present. This pattern may simply be related to higher shellfish populations present in the lower Deschutes River, with its greater flow and less seasonal fluctuations, particularly in the lower reaches, than the John Day River. This would also explain why midden sites are present along the Deschutes River but not the John Day River: the population of shellfish along the Deschutes River was large

Table 4.13. Frequency of Sites with Shell and Sites with Ground Stone Tools by Sub-basin. (Numbers in parentheses indicate the percent of sites within a given sub-basin containing the cultural item. Because some sites contain more than one type of ground stone tool, the totals of sites with ground stone may be greater than the total number of sites.)

DESCHUTES BASIN

	Lower Deschutes	Middle Deschutes	Upper Deschutes	Lower Crooked	Upper Crooked	*TOTAL*
Shell	70 (48.5)	6 (12.5)	0 (0.0)	1 (2.8)	0 (0.0)	77 (15.3)
Without Shell	74 (51.4)	42 (87.5)	3 (100.0)	35 (97.2)	271 (100.0)	425 (84.7)
TOTAL	144 (100.0)	48 (100.0)	3 (100.0)	36 (100.0)	271 (100.0)	502 (100.0)
Ground Stone						
Mano	4 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)	5 (1.8)	9 (1.8)
Metate	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	9 (3.3)	9 (1.8)
Pestle	1 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	2 (0.4)
Hopper Mortar	4 (2.8)	1 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)	5 (1.0)
Milling Stone	10 (6.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	10 (1.6)
Without Ground Stone	129 (90.0)	47 (97.9)	3 (100.0)	36 (100.0)	258 (95.2)	473 (94.2)

JOHN DAY BASIN

	Lower	Middle Mainstem	Upper Mainstem	South Fork	North Fork	*TOTAL*
Shell	8 (9.1)	2 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	10 (5.4)
Without Shell	80 (90.9)	88 (97.8)	2 (100.0)	6 (100.0)	0 (0.0)	176 (94.6)
TOTAL	88 (100.0)	90 (100.0)	2 (100.0)	6 (100.0)	0 (0.0)	186 (100.0)
Ground Stone						
Mano	15 (17.0)	7 (7.8)	0 (0.0)	0 (0.0)	0 (0.0)	22 (9.0)
Metate	22 (25.0)	8 (8.9)	0 (0.0)	0 (0.0)	0 (0.0)	30 (12.3)
Pestle	1 (1.1)	4 (4.4)	0 (0.0)	0 (0.0)	0 (0.0)	5 (2.0)
Hopper Mortar	0 (0.0)	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)
Milling Stone	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Without Ground Stone	61 (69.3)	74 (82.2)	2 (100.0)	6 (100.0)	0 (100.0)	143 (76.9)

Notes: Other ground stone items include 2 ground cobbles and a single generic ground stone. A single ground stone item (metate) was recorded in the Goose/Summer basin.

enough to draw people for the specific purpose of harvesting this resource. In the John Day basin, shellfish may have been gathered and consumed in conjunction with other resources.

Table 4.13 also presents the distribution of ground stone artifacts (manos, metates, pestles, and mortars) by basin and sub-basin. Interestingly, manos and metates are much more frequent in the John Day basin than in the Deschutes basin. Within the Deschutes basin, the Upper Crooked River sub-basin has the highest proportion of these artifacts, while in the John Day basin the highest frequency is in the Lower sub-basin, although the frequency in the Middle Mainstem sub-basin is still relatively high. We also tabulated the distribution of sites with ground stone artifacts by elevational interval (Table 4.14), with very interesting results. These sites exhibit a clear bimodal distribution (as does the distribution of sites in general--see Table 4.5), with one mode in the elevations below 3000 ft. (914 m) (with the peak between 1000 and 1999 ft.) (305-609 m), and a second, smaller mode in the elevation interval between 4000 and 4999 ft. (1,219-1,524 m). This bimodal distribution is similar for all types of ground stone items with suffiently large frequencies. To examine this distribution further, we checked the site types for sites with ground stone in these elevational intervals, and found that all (100%) of the sites with ground stone items in the 4000 to 4999 ft interval are artifact scatters. The relative frequency of artifact scatters with ground stone, as the frequency of artifact scatters among all sites (Table 4.5), tends to decrease with decreasing elevation: between 2000 and 2999 ft., 50% of the sites with ground stone are artifact scatters, between 1000 and 1999 ft., these represent 52.4% of the sites, and between 0 and 999 ft., only 4.8% The land use implications seem clear. Sites with ground stone at the upper elevations associate more often with seasonal resource-specific plant gathering and processing at short-term camps. In the lower elevations, these plant processing endeavors may have been done in conjunction with normal, everyday subsistence activities in habitation sites.

Table 4.14. Frequency of Sites with Ground Stone by Elevation Interval. (Numbers in percentages are parentheses.)

Elevation Interval	Mano (%)	Metate (%)	Milling Stone (%)	Mortar (%)	Pestle (%)
0-999	4 (12.9)	13 (32.5)	1 (10.0)	1 (16.7)	0 (0.0)
1000-1999	17 (54.8)	12 (30.0)	0 (0.0)	1 (16.7)	2 (28.6)
2000-2999	1 (3.2)	4 (10.0)	0 (0.0)	2 (33.3)	1 (14.3)
3000-3999	1 (3.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
4000-4999	3 (9.7)	8 (20.0)	0 (0.0)	0 (0.0)	3 (42.9)
5000+	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
No Elevation Recorded	5 (16.1)	3 (7.5)	9 (90.0)	2 (33.3)	1 (14.3)
TOTAL	31(100.0)	40 (100.0)	10 (100.0)	6(100.0)	7 (100.0)

Thirty-four sites were recorded with pictographs, and six sites with petroglyphs. Rock art was observed in sites other than the rock art site type: 23 (95.8%) of these are shelters/cave sites, with one (4.2%) an open site. We attempted to discern a distributional pattern for pictographs versus petroglyphs by tabulating the sites by sub-basin (Table 4.15). Unfortunately, the sample of petroglyphs is quite small and relatively evenly distributed throughout the project area, so little can be said about patterns of distribution versus pictographs. It is clear, however, that pictographs far outnumber petroglyphs, and that rock art is most frequent in the lower sub-basins.

Table 4.15. Frequency of Pictographs and Petroglyphs by Sub-basin.

Sub-basin	Pictographs	Petroglyphs
Lower Deschutes	11 (32.4)	1 (16.7)
Middle Deschutes	1 (2.9)	2 (33.3)
Upper Deschutes	0 (0.0)	0 (0.0)
Lower Crooked	3 (8.8)	1 (16.7)
Upper Crooked	0 (0.0)	1 (16.7)
Lower (John Day)	11 (32.4)	1 (16.7)
Middle Mainstem	6 (17.6)	0 (0.0)
Upper Mainstem	2 (5.9)	0 (0.0)
TOTAL	34 (100.0)	6 (100.0)

SUMMARY OF DATABASE PATTERNS

In summary, tendencies are apparent in the distribution of certain site types within the Prineville District. The strongest pattern is the presence of midden sites in the lower Deschutes basin, and their relative absence elsewhere; this pattern is supported by the presence of shell within a relatively high proportion of sites in the Lower Deschutes sub-basin. Midden sites always are on alluvial topographic features in a canyon, are near a river, and are at low elevations. The Lower Deschutes sub-basin also has the highest incidence of prehistoric rock feature sites, which are most frequently associated with talus slopes in canyons (although this may be related to the rock feature sites recorded by Hibbs et al. 1976). Open sites (most frequently those sites with housepits) and shelters/cave sites are more common in John Day basin than the other basins, and in both the Deschutes and John Day river basins these sites are more common in the lower than the upper sub-basins. These site types decrease in relative frequency with increasing elevation. Open sites typically are found on terraces and benches, within canyons, and near a river, while shelters/cave sites appear to be related to cliffs and rimrock relatively near water. Rock art sites are most frequent in the Middle Deschutes sub-basin, at the elevation interval of 2000 to 2999 ft., and are most often found associated with cliffs and rimrock. The Goose-Summer Lakes basin has the highest frequency of quarry sites, (probably resulting from the Glass Buttes [Mack 1975] survey) while within the remaining two basins this site type is most common in the lower sub-basins. Quarries are most frequent within canyons, but have little correlation with secondary landforms. Quarry sites are found most often at the elevation between 1000 and 1999 ft., decreasing in frequency with increasing elevation. Prehistoric artifact scatters are the most common site type, but found on a wide range of landforms, with little setting specificity. This site type generally increases in relative frequency with increasing distance from the Columbia River, and correspondingly with increasing elevation. One of the clearest patterns is the bimodal elevational distribution of sites with ground stone tools, and the much greater correlation of ground stone sites with artifact scatters at higher than lower elevations.

Generally speaking, less distributional patterning exists for historic than prehistoric site types. Architectural structures are much more common in the John Day basin than elsewhere. This site type typically is found within canyons, but with little correlation with other landforms, and are most common between 1000 and 1999 ft. in elevation, tending generally to decrease in frequency with increasing elevation. Canyon slopes are the most common settings for engineering structures, which tend to be relatively more frequent in the lower sub-basins of the Deschutes and John Day river basins. Historic artifact scatters exhibit a tendency to be relatively more frequent in the upper sub-basins than lower sub-basins, but have relatively little correlations with specific landforms. The remaining historic site types are too rare to form distributional patterns.

PREVIOUS REPORTS AND PUBLICATIONS

The following discussion is derived from the major reports and publications which present significant site distributional information for cultural resources in or near the Prineville District of the BLM. The intent here is not to use the raw data available in these sources, but rather to summarize the results presented. Those reports offering information derived from specific cultural resource surveys will be presented first, followed by reports describing research conducted independently of specific surveys.

One of the earliest major cultural resource inventories in the District was conducted by the University of Oregon in the Glass Buttes area (Mack 1975) (Figure 4.3). The implemented survey strategy was to examine only those areas on BLM-administered land where sites were thought likely to occur; approximately 19 square miles (about 49 km^2) were examined "intensively." One hundred and thirty-one prehistoric sites were documented, and several conclusions drawn regarding site locations (Mack 1975:5-6):

> 1) Locations which appear to have been used as campsites are most frequently found on the terraces and low ridges, often sand dunes, surrounding playas. One or more extensive sites were located adjacent to every playa surveyed....
>
> 2) The raised areas near springs also were locations of large campsites or large knapping stations.
>
> 3) Sixty-three sites were located adjacent to intermittent streams and rills. These sites varied considerably in size and composition. Some were extensive, extending 800 meters along a stream course, and others just 10 meters in diameter....
>
> 4) Fifteen small knapping stations were found along the edges, or just back from the edges, of fault scarp cliffs. Association with water sources seemed irrelevant to their location....

> 5) Occasionally large open sites would be found at the base of fault scarps, but this was unusual. No rock art was located and of the rockshelters examined, only one...contained cultural material. Moreover, this rockshelter seemed just a part of an extensive site which included open areas away from the cliff face.
>
> 6) Small knapping stations and small campsites were located in sand dune areas which today are not associated with water. However, the remnants of small dry lake beds were sometimes still visible in the area of these dunes.
>
> 7) Sites were located near but not adjacent to the heads of streams. These were knapping stations and campsites of variable size.
>
> 8) Seven extensive quarry sites were located on the rounded ridges on the north, east and west slopes of the Glass Buttes Range....

Mack (1975:45) also observed that all sites documented are associated with at least one of the following variables: an obsidian source, water, or a good view of the surrounding countryside. In summarizing, she notes that

> one could expect to find archaeological sites along intermittent streams or rills, adjacent to large obsidian sources, along the margins of dry lakes, near springs, and on the tops of fault scarp ridges and knolls in the plateau area (Mack 1975:46).

A total of 8375 acres were surveyed with varying intensity for a proposed BLM-State land exchange near Hampton, at the southern tip of the Deschutes basin (Figure 4.2) (Anonymous 1982). Forty-five cultural resource sites were recorded; 10 of these are historic, and all of the 35 prehistoric sites are artifact scatters. As noted in the report, most (83%) of these sites are associated with a hill, knob, or ridge, 10% are associated with the edge of a playa, and 17% are on an undistinguishable flat. None of the sites were near permanent water sources. A petroglyph (not recorded as a site) was observed also. All of the historic sites are also artifact scatters.

In 1976, Michael Polk, while working for the BLM, conducted a cultural resource survey along the lower John Day River (in the area comparable to the Lower sub-basin, shown above) (Figure 4.3). The survey did not extent beyond 500 meters from the John Day River, and included both BLM and privately-held land (Polk 1976). Ninety-one sites were recorded, 75 of which were on BLM-administered land. As a result of this survey, Polk was able to observe numerous site-distributional tendencies among prehistoric sites (although 25 historic sites were documented, Polk did not discuss distributional patterns for these sites). Rock features were associated strictly with talus fields, and no talus pits were found south of Clarno or north of Little Ferry Canyon. He observed a high correlation between rock art sites and habitation sites, but observed no pattern to the distribution of rock art sites except that it "appears that most of the pictographs in the canyon are found in side canyons away from the river and that the river has a relative paucity of such sites" (Polk 1976:36). Sites with housepits were the most frequent site type recorded by Polk (47, or 61.8% of all prehistoric sites), and were most commonly found on alluvial terraces close to the river, or alternatively on high benches near the river. A single site with housepits was observed 800 m up a small side canyon, on a high bench above a stream. Polk noted that these sites were located generally north of Clarno: additional survey south of Clarno revealed only a single site with housepits, prompting Polk to suggest that this distributional pattern might be real (rather than simply a factor of sampling). Rockshelters were the second most frequent site type, with 18 (23.7% of all prehistoric sites) recorded. Polk noticed a definite preference for certain locations with this site type; all were within 20 m of the river, and over 2.5 m in elevation above the river. He noted also that, among other items, most rockshelters contained shell.

In the same year, Hibbs et al. (1976) surveyed between the Warm Springs Bridge and Macks Canyon on the lower Deschutes River (Figure 4.3). The floodplains and adjacent terraces on BLM lands were the focus of the survey, though the upper terraces and associated tributaries between North Junction and Macks Canyon also were surveyed. A total of 187 sites were documented, with 135 of these clearly prehistoric. Hibbs et al. (1976:11) noted two major locational tendencies among the prehistoric sites (if distributional patterns were observed among the historic sites, they are not discussed). First, over 75% of all the prehistoric sites are within 200 m of the river, distributed in a non-random fashion. Three clusters of sites (what Hibbs et al. [1976] called "cultural zones" were identified), with village sites (those sites with multiple housepits) at the center of each cluster. These cultural zones are

> ...referred to, respectively as (a) the South Junction Zone, extending from Warm Springs Bridge downstream to North Junction; (b) the Wapinitia Zone, extending from approximately Dent downstream to the White River; (c) the Oak Creek Zone, extending from Sherars Bridge vicinity downstream to Macks Canyon (Hibbs et al. 1976:11).

Rockshelter sites tend to have a wider distribution along the river, and cluster only in the Wapinitia and Oak Creek zones. Rock art sites are most frequent in the Oak Creek Zone, with a small concentration in the Wapinitia Zone. Rock feature sites are concentrated in the Wapinitia and South Junction zones. The patterns observed are believed to "represent three discreet Native American use, or subsistence areas in the Lower Deschutes River canyon" (Hibbs et al. 1976:11). Although Hibbs et al. (1976) do not mention specific environmental associations with site types, in a different report Gannon (1978: no page numbers given) notes that, during the survey of the lower Deschutes River, rock feature sites (specifically talus pits)

> ...were seen to occur singly, in sets and as complexes, and most of them were situated at the toes of stabilized talus fields; often in proximity to springs. These invariably seem to be dispersed along major game trails..."

Geo-Recon International conducted a cultural resource survey of a 6 km (Figure 4.3) reach of the lower John Day River, recording nine previously undocumented sites, and subsequently surface collecting and test-excavating an additional 10 sites (Wilde et al. 1983). The investigators suggest that these 19 sites represent significant portions of settlement and subsistence systems (with the proviso that the riverside location of the project area omits the upland portions of these systems). Because no winter occupation sites (with housepits) were encountered during the survey, the authors suggested that the Wildcat Canyon Site on the Columbia River served as the winter habitation site, and the sites on the John Day River were used during the spring and summer. Three clusters of sites were discerned: at the confluence of John Day and Columbia rivers, at the mouth of Emigrant Canyon, and at the Narrows. Each cluster consisted of residential base camps (sites with a large number of artifact types as well as other indications of habitation) with ancillary locations (sites resulting from procurement of a single or very limited number of resources) and stations (sites where information but not tangible resources were gathered).

A cultural resource inventory and subsequent testing for a BPA transmission line crossing Central Oregon (Figure 4.3) provided the data for a study of land-use patterns by Toepel et al. (1983). The patterns observed vary between that portion of the survey north of Paulina Mountain (which coincides with the area under consideration for this overview), and that part which crosses the Fort Rock Basin (south of the Prineville District). The area north of Paulina Mountain produced relatively few (only 16) cultural resource sites, suggesting only light, intermittent aboriginal use of this region for the last several millennia (although the authors do qualify this statement by noting that the transmission line corridor misses the major river valleys). Four of the sites in this area were quarry sites, and the rest artifact scatters; all sites were " either located near an intermittent water source, or had a good view of the surrounding countryside" (Toepel et al. 1983:119). The site density within the Fort Rock Basin was much higher than the northern section of the survey.

In 1983, Oregon State University conducted a stratified, random-sample cultural resource survey of 25,000 acres (of which 10% was covered) in the Redmond Training area for the Prineville District (Lyman et al. 1983). As a result of this survey, the authors postulated environmental variables appearing to correlate with prehistoric site locations. Most (17 of 19, or 89.5%) of the sites (all of which were artifact scatters) were situated in sandy basins within 50 to 60 m of basalt outcrops. The remaining two sites were located on or near the edge of basalt plateaus overlooking sandy basins or plains. Topography appears to be a factor in site location: most sites were located on moderately broken ground, with few sites on essentially level ground, and no sites in extremely broken ground. These researchers point out that, while sites are found in these settings, the reverse is not necessarily true (not all of these settings will have sites). The historic period within this survey area was represented by artifact scatters and roads: the authors note that the survey area "seemed to historically constitute an area to 'get across' or 'pass through'," and thus there were no occupation sites within the survey area (Lyman et al. 1983:333).

Wildesen (1984) performed a landform analysis of 2,337,121 acres in north-central Oregon in an effort to identify locations where significant prehistoric archaeological sites were likely to occur. The analysis focused on landforms, and incorporated sediment, floral, and faunal information. The resultant model predicted that as much as 93% of the study does not contain significant prehistoric archaeological sites. The remaining 7%, including certain lake and river terraces, floodplains, ashy basins and sanddunes, and rimrock and mesa edges, according to the model should contain significant sites. This model is yet to be tested systematically or evaluated in terms of current significance criteria.

Scott (1986a) conducted a cultural resource survey of 29 miles along the Deschutes River between Bend and the Jefferson-Deschutes county line. This survey was restricted to the river corridor, generally within 160 m of the river. Seventy-one prehistoric sites were documented, including two rock art sites, seven rockshelters, and 62 artifact scatters. Scott (1986a:5-9) notes that

> All seven rockshelters are located in areas where the river canyon is shallow and access is easy in and out of the canyon. Of the seven rockshelters

> recorded, three face east, three face west and the remaining shelter faces south.

The majority (53, or 82.5%) of the artifact scatters were located outside the canyon, from 20 to 120 m back from the canyon rim. The remaining nine artifact scatters were observed on the floodplain adjacent to the river. Scott (1986a:9) adds that "commonly sites are situated at the mouth of draws which slope toward the river."

A final note regarding site distributional information derived from surveys is provided by one of the authors (Lebow), who in 1985 participated in a cultural resource survey for the Deschutes National Forest (Stuemke 1988). Two prominent and distinct patterns were observed in the field. The survey consisted of 100% coverage of 3570 acres straddling Highway 97 just south of Sunriver, in an area of flat plains and frequent, recent lava flows (Figure 4.3). The western edge of the survey area ran parallel to, and within 200 m of, the Little Deschutes River. Twenty-three prehistoric sites, and artifact scatters, were documented. One pattern of sites and isolated cultural debris distribution, also noted by Gibson (1989), McFarland and Davis (1985) and Silvermoon (1989), is the nearly continuous scatter of prehistoric cultural materials parallel to the Little Deschutes River. The second pattern observed, and one that was unexpected, was that sites were clearly associated with lava flows, often immediately adjacent to the lava. Our subjective evaluation in the field was that the edges of the flows were used as travel-ways, as the flows themselves were difficult to cross. In one area where the tongues of two different flows approached each other (creating a natural chute, approximately 50 m wide), a large artifact scatter with numerous projectile points was documented, suggesting the possibility that the chute was used for driving game to waiting hunters.

A number of studies have dealt specifically with, or included information pertinent to, site distributions. The following summary focuses on those studies which are not the result of specific cultural resource surveys.

Grace Zilverberg (1983) incorporated ethnographic data with food resource distributional information to develop aboriginal subsistence models for the Deschutes-Umatilla Plateau and the upper John Day Valley. She concluded that

> ...in the Deschutes-Umatilla Plateau one would expect to find spring root-gathering sites on slopes slightly upriver, and spring salmon fishing loci somewhat down-river, from winter village sites. Summer root-gathering sites and fishing areas would be upriver in the uplands or Blue Mountains. Fall berrying and hunting loci would be dispersed but with a general trend back toward the winter village. Major subsistence activity sites would have a linear pattern along the rivers....
>
> In the Upper John Day Valley in the Blue Mountain Region one would expect to find winter camps slightly above the John Day River--probably up the smaller tributaries. Spring root gathering sites would be near the villages--possibly even slightly downstream on the lower slopes and the spring salmon fishing areas on the main river below the villages. Summer camas/groundhog/cricket gathering sites would be on the John Day river floodplain as would be the fall grass seed/antelope/rabbit gathering sites. Dispersion could be expected between these major population agglomerations

> and winter would again find people moving slightly upland to village sites. Major subsistence loci would be patterned perpendicular to the river (Zilverberg 1983:134).

The cultural resource overview of the Ochoco National Forest summarizes general information relating to site distributions (Minor et al. 1987). In order to discuss the prehistoric cultural resources, the Ochoco National Forest was divided into four geographic areas: the Crooked River National Grassland, the Ochoco Mountains, the Maury Mountains, and Harney Basin (which lies outside the Prineville District). Within the Crooked River National Grassland, which is physiographically distinct from the other geographic divisions, 103 prehistoric sites had been recorded. The majority of these (69%) are artifact scatters. When compared with the other geographic areas, the Crooked River National Grassland had the majority of the rockshelter (71%), quarry (57%), and rock art sites (57%). Village sites were absent, and few plant processing sites were identified (and only manos and metates were reported in those sites with ground stone present). In the Ochoco Mountains geographic unit, 456 prehistoric sites had been reported. This region, which is environmentally diverse, had sites representing a wide range of activities, and included 14 of the 16 possible site types. The most common site type was the artifact scatter (84%). Plant processing sites were more frequent in this area (over 54.1%) than any of the other geographic areas, as were rock feature sites (65% of all such sites). Interestingly, four "village" sites (some with circular depressions) were reported in the Ochoco Mountains. One of these, the Dudley Creek Site, is on Big Summit Prairie, and contains 40 depressions; this site was test excavated, and appears to have housepits (Claeyssens, personal communication 1990). The Maury Mountains are the smallest geographic area, and only 69 prehistoric sites had been recorded, all of which were artifact scatters (five of which contained ground stone tools), prompting the authors to suggest that "the Maury Mountains were the site of seasonal camps which were the focus of hunting and gathering" (Minor et al. 1987:167).

A similar summary of the distribution of sites was presented for historic sites, grouped by the same geographic areas. A total of 108 historic sites had been recorded in the Crooked River National Grassland. This region contained more than 50% of the total settlement sites reported on the Ochoco National Forest, and cabins, homesteads, and townsites represented more than 79% of this site type. Other site types reported in this area included rock features, water developments, corrals, troughs, trails, and unspecified sites. The Ochoco Mountains had the highest proportion of historic sites on the forest; the single most frequent site type (30%) was tree features (particularly dendroglyphs). The next site type in order of frequency was sites relating to ranching (22%), and many of these probably were sheep camps. Sites related to settlement were relatively uncommon in this geographic area, which, conversely, contained all of the sites associated with mining. Only 5% of the historic resources on the Ochoco National Forest were within the Maury Mountains, but the sites there reflected a wide diversity of activities. The best represented site types were those related to settlement, ranching, water development, and the federal government. Twenty-two percent of all the historic sites recorded in the Ochoco National Forest were in the Harney Basin, which has a wide range of site types (Minor et al. 1987).

The cultural resource overview of the Brothers EIS Area within the Prineville District (Figure 4.3) also provides information regarding the distribution of certain site types (Toepel and Beckham 1978:164-168). When examining the topographic setting of previously recorded sites, the authors noted that habitation sites were usually within a quarter-mile of a water source, and added that "theoretically, longer-term camps or villages will tend to occur near larger, more dependable water resources, while small, temporary camps may be found near intermittent streams." Artifact scatters might also be situated on knolls, fault scarp ridges, and terraces which have a view of the surrounding countryside. Rockshelters and rock art sites were most likely to correlate with rocky hillsides, and quarry sites were found adjacent to sources of lithic material.

Janine McFarland (1989), as part of her analysis of two artifact scatters in the upper Deschutes Basin, examined approximately 250 site records in the Bend Ranger District of the Deschutes National Forest, and noted that "some 85% are found within a quarter mile of the Deschutes River or its tributaries," and that some "Late Prehistoric" sites were found around springs or caves within the Cascade Mountains. She proposed that aboriginal occupation during the "Archaic period" was "focused away from the river in the pine forest around ice caves and lava flows," while "the late period inhabitants focused their settlement along the mainstem of the Deschutes River and its first-order tributaries" (McFarland 1989:101-102).

One study which parallels our examination of site distributions (although on a much smaller scale) is a cultural resource overview conducted by Eastern Washington University for the Warm Springs Indian Reservation (Hartmann 1985). As part of this study, the investigators reviewed all the previously recorded site forms for a much larger area than the reservation (Figure 4.3), and correlated the site types with landforms (Hartmann 1985:46). The results show that artifact scatters, which form the most common site type (75.1% of all sites), are found on the greatest diversity of landforms (13 of a possible 15). The landform most frequently associated with this site type was stream terraces. Open sites ("housepit villages") are always associated with river or stream terraces, while midden sites are always found on river terraces. Shelters/cave sites are associated exclusively with precipitous slopes, as are the majority of rock art sites. Overall, more sites are associated with stream terraces (23.0%) than any other landform, followed by river terraces (13.1%), level slopes (12.1%), and precipitous slopes (11.4%) (other landforms, in decreasing order of site association, include gentle slopes, rock scab/prairie, meadows, ridge/saddles, springs, overlook/rim, lake/pond margin, bench, bog, and moderate slope). A predictive model was developed and tested by surveying 8941 acres on the Warm Springs Indian Reservation, from which 53 prehistoric sites were recorded (Hartmann 1985:58-79). Among these sites, the most common landform was lava plains (30%), followed by river and stream terraces (25%), gentle slopes (17%), rock flats (9%), moderate and steep slopes (4% each), and upland bogs (3%). Most (30) of the sites recorded were within 50 m of water, with the next largest group (approximately seven sites) in the 100-200 m interval. The general trend was decreasing site frequency with increasing distance from water. The majority of the sites (31) were recorded in the elevational interval between 751 and 850 m (2464 to 2789 ft), and the next most frequent elevational interval was between 651 and 750 m (2136 to 2661 ft) (the project elevation ranged from 551 to 1250 m [1809 to 4101 ft]).

A useful contribution to our understanding of site distributions within the Prineville District is Armitage's (1983) model of settlement and subsistence for the Ochoco National Forest (Figure 4.3), an area not represented in the BLM database. Armitage compiled data from ethnographic, archaeological, and environmental sources to develop hypotheses pertinent to seasonally-related site distributions. These hypotheses then were tested against data from sites recorded during cultural resource surveys on the Ochoco National Forest. His analysis indicated the following characteristics for sites representing winter activities: all were within the small site size group; 63% were associated with a permanent water source, 37% were linked to intermittent water sources; 91% were within 90 m of water (an additional site was listed as "near" water); 33% were associated with juniper vegetation; and sandy soil was linked to 63% of the sites, 27% related to "silt," and 9% with "alluvium." All of the winter activity sites were camp sites (multiple activity) at low elevations. Rockshelters were associated with 36% of the winter sites, and pictographs with 18% of the sites. Armitage (1983:108-115) suggested, therefore, that

> Winter activity areas should be small, with permanent structures, near a permanent or ephemeral source of water, generally associated with juniper and sandy soil. Lithic components should indicate a low to moderate activity range. There is a high probability that rockshelters and pictographs may be found with these sites. Faunal analysis should show a high percentage of mountain sheep, moderate percentages of mule deer, elk, antelope, and small game....Winter sites should be located in low elevation areas.

Conversely, sites relating to spring activities are in upland settings, with 62% medium-sized, 17% large, and 11% small. The majority of the sites (41%) were associated with springs, while 33% were associated with permanent sources of water and 8% with a dry source. Most (61%) of the spring activity sites were immediately associated with water, while 28% were near water, and 11% were far from water. The most frequent vegetation associated with these sites was ponderosa pine (44%), while 8% were associated with juniper, and 24% with sagebrush. Sites in this group most frequently (48%) were limited activity sites, followed by 30% moderate activity sites, and 22% high activity sites. These relationships prompted Armitage (1983:115-116) to suggest:

> A large percentage of spring sites should be near springs or a permanent water source. A high percentage should be associated with ponderosa pine. Activity should be evenly dispersed between low, moderate and high. Faunal analyses should show high percentages of mule deer, moderate percentages of fish, elk, antelope, and small game. There should be a low to moderate percentage of seeds, berries, and root utilization. Elevation should be distributed mainly in the Transition Zone.

Summer activity areas were primarily (99.3%) in upland elevations. These areas were most frequently small sites, but included also a low percentage of large and medium sites. Most (48%) were associated with permanent water sources, but 25% were linked to springs, 5% to ephemeral sources, and 7% to dry sources. Sites associated with summer were most frequently in immediate proximity to water, and most often associated with ponderosa pine and scab vegetation. Limited and moderate activity sites were most common. Faunal remains should contain a high proportion of fish remains, with moderate percentages of mule deer, elk, bison, and antelope (Armitage 1983:116).

Sites associated with fall activities were primarily small, with fewer medium and large sites. The types of water sources were similar to the spring activity sites, but a higher frequency of fall activity sites were associated with intermittent water sources, and a higher percentage of sites in immediate proximity to water. These sites were most commonly associated with ponderosa pine, but a moderate number with juniper and sagebrush. Fish remains should be the most common type of faunal remains, and a high frequency of evidence should exist for vegetal gathering or processing (Armitage 1983:117).

The final source of site distributional data to be considered here comes from the Clarno Basin. The Oregon Museum of Science and Industry, through Camp Hancock, conducted archaeological investigations (ranging from cultural resource surveys to large excavations) in the Clarno Basin between 1967 and 1980. The Clarno Basin is a broad lowland drained by the John Day River and Pine Creek (a tributary to the John Day River). The results are contained in relatively obscure annual technical reports to the National Science Foundation, and other manuscripts with limited distribution (Atherton and Houck 1976; Gannon 1968, 1970, 1972a, 1972b, 1975a, 1975b, 1978, 1979; Houck and Atherton 1977; Johnson 1972; Knapp 1979; Mazany 1980; Riggs 1967, 1969). A journal article, detailing wood identification information from archaeological remains, also was generated from the Clarno Basin investigations (Smith and Gannon 1973). In general, the data are difficult to use, as the reports, often drafts, have no continuity, often repeatedly cover the same topic, and leave large gaps in the data (or reports have been lost). No mention is made of survey methods or intensity of coverage. Although several of the reports claim to be syntheses of archaeological research in the Clarno Basin (e.g., Gannon 1978), these in fact provide site specific information for a limited number of sites. These criticisms are expressed here because the information provided below was extracted with some difficulty, and, although it is as accurate as possible, may contain errors (fortunately, further research on the Clarno Basin data is currently underway [Pam Endzweig, personal communication 1989]). Regardless of the difficulties, the results of the investigations are of great interest, because, while other research has focused along the main stem of the John Day River (e.g., Polk 1976), the studies in the Clarno Basin focused on a specific sub-basin.

According to Gannon (1975b), 57 archaeological sites were recorded or investigated by Camp Hancock crews within the Clarno Basin; a list compiled by Andy Knapp from Gannon's notes indicates 55 sites (all but two of which are away from the main stem of the John Day River)(Pam Endzweig, personal communication 1989). By reviewing this list, the Clarno Basin reports, and the site files at SHPO, it was possible to determine the site types for all but three of these 55 sites. The most frequent site type is shelters/caves (36.5%), followed closely by open sites (with housepits) (30.8%), and then artifact scatters (19.2%), rock art and rock feature sites (each with 5.8%), and quarry sites (1.9%). Rock art also was recorded in association with a number of shelters/caves sites. Ground stone implements (hopper-mortars, pestles, manos, and metates) and freshwater mussel shells were associated frequently with sites. Of interest here is frequency of the shelters/caves and open site types away from the main stem of the John Day River; in fact, most of these sites are located in tributary canyons to Pine Creek (a distributional pattern not revealed in other data). Analysis of certain sites within the basin prompted Gannon (1978) to summarize that

> The sites in and around the Clarno Basin were, in all likelihood, inhabited by nomadic peoples seasonally oriented towards a 'hunting-gathering, and possibly fishing' subsistence. The distribution of sites, in fact, seems to follow ecotones, suggesting exploitation of two habitats simultaneously. Most sites, in fact, are situated in terms of exploitable resource availability. Also, it is becoming apparent that the sites were never occupied for long during any one period. It appears, instead, that they were short-term campsites for preparation of food and toolmaking during migrations.

Mazany (1980:4), in his summary of the archaeology of the Clarno Basin, suggests that the distribution of sites "implies seasonal transhumance, exploiting a variety of plant foods at different times of the year, supplemented by hunting." These investigators also equate the distribution of sites in the Clarno Basin with a Columbia Plateau riverine-based settlement/subsistence pattern.

> At every site excavated in the Clarno Basin large numbers of freshwater mollusks (Margaritifera) were found, as were an occasional fish vertebrae [sic]. The rivers, however, do not simply supply additional resources. They also provide a resource area that structures the settlement pattern (Mazany 1980:4).

SUMMARY

The reports and publications discussed above have provided valuable site distribution information to supplement the data derived from the BLM database. One of the problems, however, is in translating the information in these reports into site types comparable to those used in the BLM database. The following summary focuses on those site types for which distributional tendencies are observed either in the BLM database, or the reports discussed above (or both).

We noted when summarizing the site-distribution tendencies apparent in the BLM database that the most obvious distributional pattern is the presence of midden sites in the Lower Deschutes sub-basin, and their relative absence elsewhere, and that sites containing shell were relatively infrequent in the John Day basin. However, Polk (1976) noticed that shell was associated with some housepit sites and most shelters/cave sites along the John Day River, and the same association was observed in the Clarno Basin, in sites away from the John Day River. Thus, while shell midden sites are found only in the lower reaches of the Deschutes Basin, sites containing shell apparently are more frequent in the John Day Basin than the BLM database indicates. This database also suggests that midden sites are always situated on alluvial features within a canyon, near a permanently flowing river, which is supported by Hartmann (1985:46), who also found that midden sites were always on river terraces. However, evidence from the Clarno Basin reveals that sites need not be along the John Day River to contain shell.

Data from the BLM database also indicate that prehistoric rock features are most frequent in the Lower Deschutes sub-basin, are found on a variety of primary landforms, and are often associated with talus slopes. This contention is supported by Gannon (1978) (most of the rock feature sites in the database were recorded by the lower Deschutes River survey [Hibbs et al. 1976], of which Gannon was a participant), who also notes that these features most often are at the toe of these talus slopes, near springs, and associated with major game trails. Proximity to water does not appear to be a factor in the location of prehistoric rock feature sites, nor is there a correlation between this site type and elevation. Toepel and Beckham (1978:167) note that in the Brothers EIS Area rock alignments all occur along ridge edges.

Based on the BLM database, prehistoric open sites are most frequent in the lower portions of the Deschutes and John Day river basins, with decreasing frequency with increasing elevations. The BLM database and Polk (1976) both indicate that sites of this type are most common on elevated terraces or high benches near a river. However, this site type is not necessarily associated with rivers. Table 4.9 indicates that open sites also associate with both permanent and intermittent streams. These associations are supported by the high frequency of sites of this type in the Clarno Basin, away from a river, and usually in tertiary canyons with intermittent streams. Zilverberg (1983) suggests that winter villages (presumably open sites) in the Deschutes-Umatilla Plateau should be along the rivers, but that in the Upper John Day Valley, these sites should be along the smaller tributaries above the John Day River. Based on sites reported in the Bend District of the Deschutes National Forest, McFarland (1989:101-102) indicates that late period prehistoric settlement sites should be along the Deschutes River and its major tributaries. Hartmann (1985) found that open sites were always on terraces, in association with streams and terraces, and Armitage (1983) stated that winter activity areas (sites with permanent structures) should be in low elevations, near a permanent or intermittent water source. Therefore, the preponderance of evidence indicates that open sites are situated on terraces or benches, near an intermittent or permanent source of water, and that these sites are most frequent at lower elevations.

The prehistoric shelters/cave site type has a distribution similar to the open site type. These are most common in the lower portions of the John Day and Deschutes basins, and decrease in frequency with increasing elevation. These sites are found typically near an intermittent or permanent source of water, and are associated with cliffs and rimrock. Hartmann (1985) correlated this site type with "precipitous slopes," while Toepel and Beckham (1978:168) linked rockshelters with rocky hillsides. Polk (1976) observed that all the shelters/cave sites along the lower John Day River were within 20 m of the river, and were at least 2.5 m in elevation above the river. Easy access in and out of the canyon was a factor noted by Scott (1986a) in the location of shelters/cave sites.

Rock art sites also are typically associated with cliffs and rimrock, most frequently between 2000 and 2999 ft; Toepel and Beckham (1978:168) noted that rocky hillsides are likely locations for pictograph sites. Data in the BLM database also suggest that these sites are relatively near a water source, although Polk (1976) observed that rock art sites are rare adjacent to the John Day River, with most occurring in tertiary canyons. It should be noted that rock art frequently occurs in conjunction with shelters/cave sites, and that pictographs are much more frequent than petroglyphs.

Data in the BLM database suggest that quarry sites are most frequent in the Goose-Summer Lakes Basin, and are also common in the lower basins of the Deschutes and John Day rivers. Obviously, this site type is directly associated with a source of lithic material suitable for stone tool manufacture. It is most frequent in the elevational interval of 1000 to 1999 ft, with decreasing frequency as elevation increases. Based on the database, we could discern little correlation between this site type and secondary landforms, although Mack (1975:6) indicated that in the Goose-Summer lakes basin these sites are "located on rounded ridges." Toepel et al. (1983) noted that quarry sites are situated near an intermittent stream, or else at a place with a good view of the surrounding countryside. The quarry sites listed in the database also are most frequently associated with intermittent streams, although a high proportion of the sites are associated with rivers as well.

The most common site type, prehistoric artifact scatters, exhibits the lowest tendency to correlate with specific environmental variables. Data from the BLM database indicate that artifact scatters increase in relative frequency with increasing distance from the Columbia River (correspondingly, this site type is relatively less frequent at the lower than at the upper elevations). Of all the site types, prehistoric artifact scatters are found on the widest range of primary and secondary landforms, and also are linked to the widest range of water sources. In fact, water may not have been a primary determinant of site location, as this site type had the second greatest average distance to water. The analysis of site distributions conducted by Hartmann (1985) reached similar conclusion for the distributions of artifact scatters: this site type was found on the greatest diversity of landforms. In the Goose and Summer lake basin, Mack (1975) noted an association of these sites with intermittent or extant water sources, a good view, or an obsidian source, an observation also made (with the exception of the association with obsidian sources) by Toepel et al. (1983). Toepel and Beckham (1978:168) pointed out that, in the Brothers EIS Area, artifact scatters usually were within a quarter-mile of a water source, might be associated with knolls, fault scarp ridges, and terraces, and had a view of the surrounding countryside. A survey near the town of Hampton revealed that sites of this type were most frequently associated with a hill, knob, or ridge; some sites also occurred along the edges of playas, while others were on undistinguishable flat plains (Anonymous 1982). In the Redmond Training Area (a region with no current water sources), artifact scatters appeared to be related to specific topographic features: sandy basins with basalt outcrops nearby (Lyman et al. 1983). A survey along the Deschutes River north of Bend found that these sites were most often on the canyon rim, rather than inside the canyon (Scott 1986a). One of the authors (Lebow) has observed that, in areas with recent lava flows, artifact scatters are concentrated along the edges of the flows. Based on an examination of the literature in which site distributions are discussed, it appears that the locations of artifact scatter sites may tend to pattern in specific locales, but that on a larger scale (such as the entire Prineville District), little correlation exists with specific settings. One reason for this could be that the artifact scatter site type presumably subsumes a number of different functions; at specific locales, fewer functions may be represented than in the District as a whole, and thus such sites should show patterning related to those functions.

Based on the data in the BLM database, historic site types have a less patterned distribution than prehistoric sites. Architectural structures are more frequent in the John Day Basin than elsewhere, are commonly found within canyons, are the most frequent historic site type in the lowest elevations, and are more often related to rivers than other water sources (although the average distance to water is relatively great). The locations of historic artifact scatters, like their prehistoric counterparts, exhibit relatively little patterning. These sites tend to be more frequent in the upper sub-basins when compared to the lower sub-basins, and are most commonly found in the elevational interval between 4000 and 4999 ft. Among the historic site types, artifact scatters are found on the greatest diversity of primary and secondary landforms and water sources. These sites are linked most frequently to canyons, terraces, and intermittent streams, and the average distance to water is relatively great. Engineering structures are most often associated with canyon slopes, and their highest frequency lies between 3000 and 3999 ft.

5. RESOURCE USE CATEGORIES

This chapter concerns the provisional assignment of sites to resource use categories, management tools developed by the BLM to aid in the determination of appropriate treatment of sites in terms of a variety of possible uses. Six resource use categories are defined by the Bureau of Land Management (1989a): (1) discharged use, (2) scientific use, (3) management use, (4) public use, (5) socio-cultural use, and (6) conservation for future use. Assignment of sites or groups of sites to resource use categories in this chapter is based upon an analysis of the BLM Prineville District's cultural resource inventory records. This was accomplished through identification of characteristics which contribute to a site's possible use, and by consideration of National Register eligibility criteria (36 CFR 60.4). These resource categories are not mutually exclusive: a site may be placed in more than one category.

Only 18 of the 903 sites in the BLM's ARCSITE database file have had any degree of test excavations; and most of these excavations were not done with the National Register criteria in mind. Available site information is limited primarily to records made from surface observations of cultural material. These observations were made by recorders of varying levels of formal archaeological or historic training and experience.

In addition, the relative age of many site records raise questions as to how closely current site conditions conform to what was recorded 5, 10, or 20 years ago. Further, changes in archaeological orientation over time raises questions as to the comparability of data and the adequacy of the data records to assess the current research potential of sites. Thus, the following assignments of sites to resource use categories must be considered provisional, pending further archaeological or historical investigations sufficient to produce current data for evaluation of sites according to the National Register criteria specified in 36 CFR 60.4. In nearly all cases these provisionally assigned sites should be seen as "candidates" for assignment to a particular resource use category.

DISCHARGED USE

According to BLM specifications (Bureau of Land Management 1988), a cultural property is assigned to the discharged use resource category when it "no longer possesses the qualifying characteristics" for assignment to another resource use category. No sites were provisionally assigned to this category because of the deficiencies in the database noted above.

SCIENTIFIC USE

According to BLM specifications (Bureau of Land Management 1988), this category is for cultural properties "determined to be presently eligible for consideration as the subject of scientific or historical study utilizing research techniques currently available, including study which would result in its physical alteration, and signifies that it need not be conserved in the face of an appropriate research or data recovery (mitigation) proposal." Because so few sites in the BLM ARCSITE database files have been evaluated in accordance with National Register criteria, we initially encountered difficulty in assessing any site for scientific or historical study, as well as the appropriateness of not conserving any particular site. As a result of discussions with BLM personnel (Richard Hanes, personal communication 1990), we subdivided this category into two sub-categories: unevaluated scientific use, and evaluated scientific use.

The sub-category of unevaluated scientific use is in effect a "default" category for sites which have not been formally evaluated according to National Register criteria. Thus, all prehistoric sites except 35SH23 (Macks Canyon Site, currently on the National Register) have been assigned to unevaluated scientific use. An important management goal concerning these sites should be a determination of eligibility to the National Register according to the criteria specified in 36 CFR 60.4, as well as an identification of characteristics for reclassification of a site into evaluated scientific use or one of the other resource use categories. National Register nomination forms have been started or completed for several sites and site complexes which may be eligible. However, no formal evaluation has been completed for any of these sites or site complexes. These include archaeological districts along the John Day River near Thirtymile Creek and the Gooseneck-Ferry Canyon vicinity, the complex of sites identified during the survey of the Deschutes River corridor (Hibbs et. al. 1976), the Sinamox Pictograph Site, the Nena Rockshelters, the Sage Hollow Juniper Hut, and others. These sites merit additional attention and are discussed in Chapter 7, *Management Opportunities*, below.

Assignment of Site 35SH23 to the evaluated scientific use sub-category should be considered provisional pending a re-evaluation of the site's curated artifact collection. This site was tested originally in 1965. Since then shifts in archaeological research orientations have occurred both regionally and within the profession at large. In addition, old investigative techniques have been refined and new techniques developed which could produce new information from the site and its artifact collection. For these reasons it would seem prudent to re-evaluate the site with these considerations in mind.

As with prehistoric sites, all unevaluated historic sites have been assigned to unevaluated scientific use. Two historic resources, the Spanish Gulch District (Willingham 1982) and the Fourmile Canyon Segment of the Oregon Trail (which apparently has no site form), have been formally evaluated and found eligible for inclusion on the National Register (Richard Hanes, personal communication 1990), and thus are provisionally assigned to the evaluated scientific use sub-category. Nomination forms have been started or completed for several other historic sites for which no site forms exist, including the McDonald Crossing of the John Day River (a part of the Oregon Trail), a 12-mile segment of the Meek Cutoff, the Willamette Valley and Cascade Mountain Military Wagon Road, Sherar's Bridge and Falls, and the Oregon Trunk Railroad Stationmasters Quarters at Maupin. All of these historic sites lacking site forms are discussed further in chapter 7, *Management Opportunities*.

MANAGEMENT USE

According to BLM specifications (Bureau of Land Management 1988), the management use category involves cultural properties "considered eligible for controlled experimental study which would result in its physical alteration" and "justified for purposes of obtaining specific information leading to a better understanding of kinds and rates of natural or human-caused deterioration, effectiveness of protection measures, and similar lines of inquiry, the results of which would ultimately aid in the management of other cultural properties." Candidate sites were provisionally assigned to this category based on either one of two sets of criteria.

We first identified sites with a recorded integrity of 50 percent or less (for site types other than shelters/cave and burials, discussed below) and which appeared to have the opportunity for controlled experimental study based on a site's environment, location or both. The chosen integrity figure of 50 percent was somewhat arbitrary, although we felt that sites with greater integrity would be more likely to yield the types of information required for National Register consideration under 36 CFR 60.4. Additional disturbance to the low-integrity sites by experimental studies would, therefore, be less likely to result in the loss of important information.

We also felt that, because they tend to have conditions generally more conducive to the preservation of organic materials and stratigraphy, shelters/cave sites with any remaining integrity could yield important information and should be excluded from consideration for management use. We felt also that by their very nature sites with burials were more appropriate candidates for provisional assignment to the socio-cultural use category. Thus, using integrity as a filter, we arrived at a set of sites which were then examined for their appropriateness for experimental studies regarding the effects of timber harvesting and livestock grazing, two important land-use activities on BLM land. The plant communities recorded for these sites assisted this evaluation by indicating which sites were in areas potentially containing harvestable timber or conditions appropriate for livestock grazing. Using this full set of criteria we identified seven candidate sites for provisional assignment to the management use category (Table 5.1).

Sites 35SH26, 35SH29, 35DS44, and 35WS10 have low integrity and are located in areas which may be subject to disturbance by livestock grazing or range improvements. They may offer the potential for experimental studies into the effects of these activities on archaeological sites.

Sites OR-05-007, 35DS46, and OR-05-0869 have low integrity and are located in areas which may be subject to disturbance by timber harvest activities. They may offer the potential for experimental studies into the effects of timber harvest activities on archaeological sites, and assessments of the disturbance potential of various timber methods.

Two actions should be taken prior to advancement of candidate sites into the management use category. Confirmation that a site is not significant under National Register criteria should be made by adequate site testing. Also, BLM personnel should, using more detailed environmental information, confirm that a site is in an appropriate environment for the types of experimental studies described above.

The second set of criteria for identifying candidate sites for provisional assignment to management use involved a recorded integrity of less than 100 percent for open sites with housepit features which have potential applicability also to the public use resource category. Sites 35SH91, 35WS10, 35WS42, 35WS46, 35WS50, 35WS72, and 35WS89 are open sites with housepit features which have been subjected previously to disturbance from artifact collectors. Discussion concerning their potential management use will be presented below within the context of the public use resource category.

Table 5.1. Candidate Sites for Provisional Assignment to the Management Use Resource Category.

Agency or SHPO Number	Area (m²)	Site Type	Plant Community	Integrity	Date Recorded
OR-05-0007	6	Artifact Scatter	Ponderosa Pine Zone	20%	06/28/78
35SH26	170	Artifact Scatter	Shrub	50%	09/16/76
35DS44	232	Artifact Scatter	Shrub	50%	07/30/68
35DS46	-	Artifact Scatter	P. Pine, W. Juniper	50%	02/01/78
35SH29	5,576	Midden	Shrub	15%	07/31/68
OR-05-0869	250	Artifact Scatter	Lodgepole Pine Zone	50%	11/10/89
35WS10	-	Open Site	Shrub	25%	08/01/68

PUBLIC USE

According to BLM specifications, this category includes cultural properties "found to be appropriate for consideration as an interpretive exhibit-in-place, a subject of supervised participation in scientific or historical study, or related educational and recreational uses by members of the general public." Criteria for identifying candidate sites for provisional assignment to this category included (1) sites located at or near existing BLM recreational or other public facilities (Figure 5.1 and Table 5.2), (2) sites located within Wild and Scenic River corridors (Figure 5.1 and Table 5.3), and (3) sites located near state or federal highways (Figure 5.2 and Table 5.4)

Several actions should be taken prior to advancement of candidate sites into the public use category. The significance of a site should be determined first according to National Register criteria (36 CFR 60.4). BLM personnel should, using more detailed information concerning recreational use patterns and records of site disturbances from artifact collection, assess the potential impact on a site's integrity caused by its assignment to the public use category. BLM personnel also should weigh the various management costs and benefits of this assignment for the areas in which a site may be located, for instance in Wild and Scenic River corridors, highly productive timberlands, and prime grazing areas.

Among the BLM's current public attractions, the McDonald Crossing of the John Day River, a part of the Oregon Trail and now marked by a simple stone, is an historic site which has great interpretive potential. However, as the previous discussion of this site in the context of the scientific use category indicated, no site form exists for it. Despite the lack of recorded site information, the crossing is well known to the public. We therefore provisionally assign it to the public use category. Sites OR-05-0714(H), OR-05-0713(H), and OR-05-0709 are located near the McDonald Crossing. The first two of these sites are historic rock alignments. Should evaluations according to National Register criteria find that these sites have some historic link to the Oregon Trail, or, as recently reported (Hanes, personal communication 1990), related to an historic tollroad, it would seem appropriate to assign them to the public use category as representatives of transportation history. Further, should an evaluation of prehistoric site OR-05-0709 indicate that this artifact scatter was

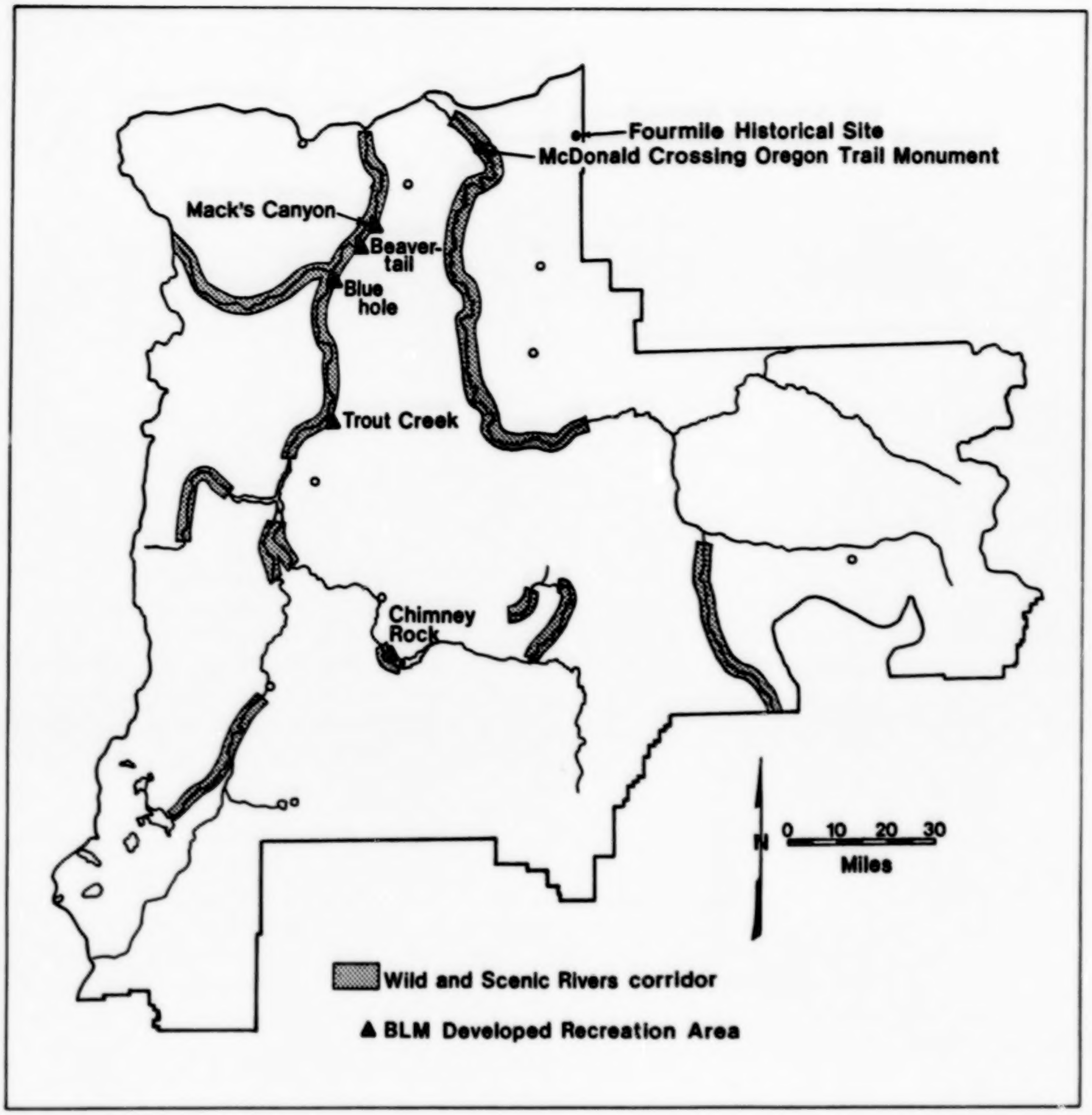

Fourmile Historical Site
McDonald Crossing Oregon Trail Monument
Mack's Canyon
Beaver-tail
Blue hole
Trout Creek
Chimney Rock
N
0 10 20 30
Miles
Wild and Scenic Rivers corridor
▲ BLM Developed Recreation Area

Figure 5.1. BLM Developed Recreation Areas and Wild and Scenic River Corridors Considered when making Provisional Assignments to the Public Use Category.

contemporaneous with use of the Oregon Trail, assignment to the public use category may also be appropriate.

Table 5.2. Candidate Sites at or near BLM Recreational Facilities for Provisional Assignment to the Public Use Resource Category.

Facility	Legal Location	Agency or SHPO Number	Area (m^2)	Site Type	Nature of Site
Near OR Trail Monument	T1N R19E S2	OR-05-714(H)	160	Rock Feature	Rock alignment
	T1N R19E S11	OR-05-709	34,000	Artifact Scatter	Flakes
		OR-05-713(H)	1,094	Rock Feature	Rock alignment
Macks Canyon Recreation Area	T2S R15E S13	35SH23	32,000	Open Site	Housepits, shell, flakes
	T2S R15E S24	35SH98	180	Midden	Graver, shell
		35SH99	150	Midden	Shell, cobble chopper
		35SH101	8	Artifact Scatter	Flakes, core
		EA-12	139	Engineering Structure	Terraced stone trestle foundation, wood
Beavertail Recreation Area	T3S R15E S4	35SH94	96	Shelters/Cave	Shell, flakes
		EA-10	20,000	Engineering Structure	Excavated terraces
Pine Tree Boat Launch	T3S R14E S14	35SH92	12	Midden	Shell, fauna
Handicap Fish Park	T4S R14E S21	35WS57	100	Midden	Shell, fauna
S Junction Park	T8S R14E S21	35WS112	15	Midden	Shell
		35WS113	3,000	Midden	Shell, flakes
Along BLM Deschutes River Hiking Trail	T9S R13E S14	35JE86	150	Midden	Shell
	T9S R13E S15	35JE84	180	Midden	Shell
		35JE85	2	Midden	Shell
	T9S R13E S12	35JE61	1,000	Artifact Scatter	Flakes
		35JE62	2,457	Open Site	Flakes, housepits
		35JE87	360	Rock Feature	Talus Pits
		35JE88	16	Rock Feature	Talus pit
		35JE90	9	Rock Feature	Talus pit
	T9S R13E S13	35JE63	50,000	Rock Feature	Talus pits, cairns
	T9S R14E S6	35JE59	6,537	Open Site	Midden, housepit, point
	T9S R14E S7	35JE60	967	Midden	Midden, flakes, hopper mortar
		35JE81A-E	20,000	Rock Feature	Talus pits, cairns
	T9S R13E S20	35JE80	450	Artifact Scatter	Flakes, shell
		35JE82	600	Midden	Shell

The Fourmile Segment of the Oregon Trail, now signed with information on its historic significance, is another historic site which has interpretive potential, but for which no site form exists. Because interpretive material already being present at the site, we provisionally assign it to the public use category.

Sites 35SH23, 35SH98, 35SH99, 35SH101, and EA-12 are located at or near the Macks Canyon Recreation Area on the Deschutes River. Indeed, Site 35SH23, an open site on the National Register, has housepits and is located at a campground. It is currently fenced and signed in an attempt to prevent further disturbance by artifact collectors. Because Site 35SH23 is on the National Register, is at an existing campground and is currently signed, it would seem an appropriate candidate for an interpretive exhibit-in-place with reference also

Table 5.3. Candidate Sites Within Wild and Scenic River Corridors for Provisional Assignment to the Public Use Resource Category.

River	Legal Location	Agency or SHPO Number	Area (m^2)	Site Type	Nature of Site
Upper Deschutes	T14S R12E S9	35DS372	50,000	Artifact Scatter	Flakes, point, biface
	T14S R12E S11	35DS350	30,000	Artifact Scatter	Flakes
	T14S R12E S14	35DS349	4,500	Artifact Scatter	Flakes, bifaces
		35DS369	1,200	Artifact Scatter	Flakes
		SS 61	225	Architectural Structure	Cabin, corral, lumber, round nails, stove parts, chair
	T14S R12E S26	35DS55	10,000	Artifact Scatter	Flakes, points, biface, uniface
		35DS364	100,000	Artifact Scatter	Flakes, point, biface
	T13S R12E S8	35JE71	204	Shelters/Cave	Shell, petroglyph
	T13S R12E S17	35JE70	4	Shelters/Cave	Shell, faunal remains, scraper
		35JE72	10,000	Midden	
	T13S R12E S21	35JE52	217	Shelters/Cave	Burial, matting, petroglyphs, shell
		35JE53	-	Shelters/Cave	Unknown
	T13S R12E S33	35JE64	16,278	Shelters/Cave	Flakes, shell, hopper mortar
Lower Deschutes	T1S R16E S4	OR-05-0815(H)		Other	Spring development, metal, pipe, lumber, railroad ties
	T2S R16E S6	EA-13	367,896	Engineering Structure	Railroad bed
	T2S R16E S7	35SH29	5,576	Midden	Shell, flakes, scraper
	T2S R16E S19	35SH102	50	Shelters/Cave	Flakes, faunal remains, shell
	T2S R15E S13	35SH23	32,000	Open Site	Housepits, shell, flakes
		35WS76	1,200	Open Site	Shell, flakes, housepits, biface
	T2S R15E S23	35WS108	1,500	Open Site	Housepits, knife, cobble choppers, milling stones, flakes, shell
		35WS77	300	Quarry	Flakes
	T2S R15E S24	35SH98	180	Midden	Graver, shell
		35SH99	150	Midden	Shell, cobble chopper
		35SH101	8	Artifact Scatter	Flakes, core
		EA-12	139	Engineering Structure	Terraced stone trestle foundation, wood
	T2S R15E S26	35SH26	60	Artifact Scatter	Flakes, shell, fire-cracked rock
		35SH96	50	Open Site	Flakes, housepits, biface, shell
		35SH97	72	Artifact Scatter	Flakes, shell
		35WS53	1,800	Open Site	Housepit, flakes
		EA-11	28	Other	Excavated terrace
	T2S R15E S34	35WS50	3,500	Open Site	Housepits, hearth, point, blank, fire-cracked rock, flakes
		35WS52A	-	Open Site	Possible housepit
		35WS52B	40	Open Site	Possible housepits
	T3S R15E S3	35SH86	60	Artifact Scatter	Flakes
		35SH87	150	Shelters/Cave	Flakes, pictographs, faunal remains, shell
	T3S R15E S4	35SH88	-	Artifact Scatter	Flakes, drill
		35WS48	4,000	Open Site	Housepits, faunal remains, cobble chopper, hammerstone, mortar, point, shell
		35SH94	96	Shelters/Cave	Shell, flakes
		35WS49	120	Artifact Scatter	Faunal remains, shell, flakes
		35WS51	1,000	Quarry	Flakes
		EA-8	209	Artifact Scatter	Excavated pits, bottle glass, stoneware, sheet metal, metal can
		EA-9	65	Artifact Scatter	Metal cans, bottle glass, ceramic, cutbone
		EA-10	20,000	Other	Excavated terraces
	T3S R15E S3	35SH83	45	Shelters/Cave	Pictograph, shell
		35WS42	7,200	Open Site	Housepits, cobble tools, flakes, choppers, manos, points, shell
		35SH27	3,500	Open Site	Housepits, faunal remains, shell, flakes, hammerstone

Table 5.3. (Continued).

River	Legal Location	Agency or SHPO Number	Area (m²)	Site Type	Nature of Site
		EA-6	232	Artifact Scatter	Stoneware, bottle fragments, window glass, shell button
		EA-15	-	Artifact Scatter	Bedframe, brick, concrete, window and bottle glass, wire nails, stove, cans, metal
		35SH85	216	Quarry	Flakes, shell
	T3S R15E S17	35SH28	9	Shelters/Cave	Pictographs, shell, flakes
		35SH84	144	Shelters/Cave	Pictographs, shell, faunal remains, flakes, bead
		35SH93	-	Artifact Scatter	Flakes, shell, faunal remains
		35WS46	1,500	Open Site	Housepits, shell, millingstone, flakes, knife
		35WS47	100	Midden	Shell, flakes
	T3S R14E S13	35WS41	900	Open Site	Housepits, flakes
		EA-2	10,000	Artifact Scatter	Tin cans, bottle glass, metal
	T3S R14E S14	35SH91	1,000	Open Site	Housepits, flakes, shell
		35SH92	12	Midden	Shell
		35SH89	18	Open Site	Possible housepit
	T3S R14E S23	35WS11	100	Shelters/Cave	Flakes, shell, faunal remains
		35WS40	100	Shelters/Cave	Flakes, pictographs
		35WS44	400	Open Site	Housepits, scraper, biface, cobble chopper, flakes, shell
		EA-3	10,000	Artifact Scatter	Metal, excavated terraces, bolts, eye ring, chain link, road
		EA-14	-	Artifact Scatter	Line shack, stove, cans, metal, bolt
		35WS10	-	Open Site	Flakes, bifaces, mortars, housepits
	T3S R14E S35	35WS34A	90	Artifact Scatter	Flakes, core chopper, shell
		35WS34B	20	Open Site	Housepit (?)
		35WS111	66	Artifact Scatter	Cores, flakes
		EA-1	1,000	Artifact Scatter	Foundations, rock alignments, glass, bottles, tinware, button
		EA-5	750	Engineering Structure	Flume, wood, trestle, bolts
		EA-7	3	Rock Feature	Rock dome, bowl, cut bone
		EA-16	4	Rock Feature	Rock structure, tin cans, sheet metal
	T4S R14E S9	35WS55	800	Open Site	Flakes, shell
	T4S R14E S17	35WS56	800	Midden	Shell
	T4S R14E S29	35WS59	900	Artifact Scatter	Shell, flakes
	T4S R14E S33	35WS61	1,600	Open Site	Biface, milling stones, flake, faunal remains, shell, chopper
	T5S R14E S7	35WS78A	6,000	Rock Feature	Talus pits, cairn, quarry, cores, flakes, biface
		35WS78B	900	Open Site	Housepits, talus pits, cairns, flakes
		35WS78C	7,500	Rock Feature	Talus pits, cairn
		35WS78D	40,000	Quarry	Cores, spills, flakes, blades, talus pits
		35WS78E	400	Quarry	Talus pits
		35WS93	60,000	Rock Feature	Flakes
		35WS97	900	Rock Feature	Talus pits
	T5S R13E S12	35WS62	3,000	Rock Feature	Talus pits
		35WS66	2,100	Open Site	Milling stone, hammerstone, flakes, shell, housepits
		35WS67	300	Open Site	Housepit
		35WS98	140	Rock Feature	Talus pits
	T5S R13E S13	35WS68	40	Midden	Shell, flakes
		35WS96	2	Rock Feature	Talus pits
	T5S R13E S24	35WS64	2,000	Midden	Shell, millingstone, cobble chopper, flakes
		35WS65	1,200	Open Site	Housepits, flakes, core, biface, shell
		35WS9	4,182	Midden	Shell, cobble tools, faunal remains, flakes
		35WS12A	372	Midden	Shell

Table 5.3. (Continued).

River	Legal Location	Agency or SHPO Number	Area (m^2)	Site Type	Nature of Site
		35WS12B	186	Midden	Shell
	T5S R13E S25	35WS69	100	Rock Art	Pictograph, flakes, shell knife
	T6S R14E	35WS72	3,500	Open Site	Flakes, housepits, shell
	T6S R14E S21	EA-34	150	Architectural Structure	Structure, stove, bedsprings, sheet metal, wire nails
	T7S R14E S17	35WS79	80	Shelters/Cave	Battered cobbles, ground cobbles, milling stone, shell, knife, faunal remains, flakes
		35WS80	1,500	Artifact Scatter	Shell, milling stones, flakes, cores, battered cobbles
		35WS88	3,000	Open Site	Shell, flakes, drill, battered cobbles, housepits
		35WS91	1,500	Open Site	Point, knife, battered cobbles, pestle, flakes, shell, housepits
		35WS92A	150	Midden	Shell, flakes
		35WS92B	150	Midden	Shell, cracked cobbles
	T7S R14E S20	35WS90	1,225	Open Site	Housepits, flaked cobbles, shell
	T7S R14E S29	35WS89	12,000	Open Site	Flakes, shell, housepits
	T8S R14E S4	35WS101B	400	Midden	Shell, flake
	T8S R14E S10	35WS99	400	Artifact Scatter	Flakes
	T8S R14E S21	35WS105	1,625	Open Site	Hammerstone, housepits, flakes, shell
		35WS112	15	Midden	Shell
		35WS113	3,000	Midden	Shell, flake
	T8S R14E S29	35WS94	2,500	Open Site	Housepits, mano
	T9S R14E S6	35JE59	6,537	Open Site	Midden, housepit, point
	T9S R14E S7	35JE81A-E	20,000	Rock Feature	Talus pits, cairns
		35JE60	967	Midden	Midden, flakes, hopper mortar
	T9S R13E S12	35JE87	360	Rock Feature	Talus pits
		35JE88	16	Rock Feature	Talus pit
		35JE90	9	Rock Feature	Talus pit
		35JE61	1,000	Artifact Scatter	Flakes
		35JE62	2,457	Open Site	Flakes, housepits
	T9S R13E S13	35JE63	50,000	Rock Feature	Talus pits, cairns
	T9S R13E S14	35JE86	150	Midden	Shell
	T9S R13E S15	35JE84	180	Midden	Shell
		35JE85	2	Midden	Shell
	T9S R13E S20	35JE80	450	Artifact Scatter	Flakes, shell
		35JE82	800	Midden	Shell
John Day (Main Stem)	T1N R20E S31	050-HS-10	-	Architectural Structure	House, automobiles, canal, stove, refrigerator, wood, farm machinery, pipe, misc. metal
	T1N R19E S2	OR-05-0714(H)	160	Rock Feature	Rock alignment
	T1N R19E S11	OR-05-0709	34,000	Artifact Scatter	Flakes
		OR-05-0713(H)	1,094	Rock Feature	Rock alignment
	T1S R19E S10	35SH39	5	Shelters/Cave	Pictographs, metate
		35SH40	5,580	Open Site	Housepits, flakes, blades, metate point
		OR-05-0777	4,800	Artifact Scatter	Flakes, cores
		OR-05-0783	2,400	Quarry	Flakes
	T1S R19E S11	OR-05-0778	6,000	Artifact Scatter	Flakes, cores
	T1S R19E S30	35GM54	198	Open Site	Housepits
		35SH58	6	Shelters/Cave	Flakes
		35SH59	23	Shelters/Cave	Metates, flakes, faunal remains
		35SH60	23	Shelters/Cave	Flakes, shell, faunal remains
	T1S R19E S31	35SH57	15	Shelters/Cave	Metate, flakes, faunal remains
		050-HS-7	2	Burial	Grave cairn
	T2S R19E S6	050-HS-15	-	Architectural Structure	House, privy, foundation, cellar, cultivator, stove, bedsprings, nails, glass
	T2S R18E S12	35SH68	2,750	Open Site	Housepits, flakes

Table 5.3. (Continued).

River	Legal Location	Agency or SHPO Number	Area (m²)	Site Type	Nature of Site
	T2S R18E S14	35SH56	64	Open Site	Housepit
	T2S R18E S23	35GM53	12,792	Artifact Scatter	Flakes, scrapers
		35SH37	-	Artifact Scatter	Flakes, hearth
		35SH50	79	Open Site	Housepit, flake
		35SH54	21	Shelters/Cave	Metates, scraper, flakes
		35SH55	350	Open Site	Housepits, metate, flakes
	T2S R18E S24	35SH35	105	Shelters/Cave	Flakes
		35SH53	2,552	Open Site	Housepits, flake, mano, metate
		OR-05-HS-5	508	Engineering Structure	Ferry, cable, rock pile, winch, rock wall
	T2S R18E S26	35GM51	460	Open Site	Housepits, flakes
		35GM52	130	Open Site	Housepits
		35SH33	1,551	Open Site	Housepits, flakes, mano
		35SH51	40	Open Site	Housepits, flakes
		35SH52	18	Shelters/Cave	Flakes, shell
		35SH125	20	Shelters/Cave	Rock alignment
	T2S R18E S35	35SH67	1,495	Open Site	Pictographs, flakes, biface, faunal remains, metate, lumber, glass, cans
	T3S R18E S2	35GM65	4,947	Open Site	Housepits, hearth, charcoal, talus pits, faunal remains, flakes, scrapers, metates, shell
		35SH34	12	Shelters/Cave	Pictographs, metates, flakes
		35SH65	[illegible]6	Shelters/Cave	Flakes
		35SH66	40	Open Site	Housepits
		050-HS-13	-	Architectural Structure	Structure, masonry
		050-HS-14	85	Other	Still, rock wall, metal, stove pipes, water pipes, sheet metal, wood
	T3S R18E S11	35GM63	1,615	Rock Feature	Talus pits, rock alignments, cairns
		35GM64	792	Open Site	Housepits, talus pits, cairns, flakes
	T3S R18E S13	35GM59	7,920	Open Site	Housepit, rock circles, talus pits, cairns, flakes
		35GM60	3,400	Open Site	Housepits, flakes
		35GM67	900	Open Site	Housepit
	T3S R18E S14	35GM61	-	Open Site	Housepits, flakes, fire-cracked rock, faunal remains
		35GM62	1,767	Open Site	Housepits
	T4S R18E S2	35GM58	24	Shelters/Cave	Flakes, pictographs
	T4S R18E S3	35SH64	408	Shelters/Cave	Flakes, blades, knife, metates, manos, chopper, shell, pictograph
	T4S R18E S10	35GM50	600	Open Site	Housepits, flakes, blades, scrapers, point
	T4S R18E S11	35GM55	940	Open Site	Flakes, mano, housepits
		050-HS-8	3,750	Architectural Structure	Cabin, corral, stove, cans
	T4S R18E S23	050-HS-9	167	Other	Covered wagons (movie set)
	T4S R18E S24	050-HS-12	-	Architectural Structure	Cabin, corral, stove, bottle, glass, cans
	T5S R18E S25	35SH61	1,360	Open Site	Housepits, flakes
	T5S R19E S8	35SH63	11,050	Open Site	Housepits, flakes
		050-HS-3	-	Engineering Structure	Canal, lumber
	T5S R19E S9	35GM42	104	Shelters/Cave	Flakes, manos, shell, faunal remains
		35GM43	1,320	Open Site	Housepits, manos, metate
		35GM44	2,900	Open Site	Housepits, flakes, manos, metates
		35GM45	300	Open Site	Housepits, flakes, mano, chopper, metate
		35GM48	77,400	Open Site	Housepits, talus pits, rock alignments, mano
		35GM49	73,000	Open Site	Housepit, talus pit, cairns, flake
		35SH41	4,050	Open Site	Housepits
	T5S R19E S17	35SH44	300	Open Site	Housepits
		35SH46	280	Open Site	Housepits
		35SH47	425	Open Site	Housepits
		35SH48	1,050	Rock Feature	Talus pits, cairns

Table 5.3. (Continued).

River	Legal Location	Agency or SHPO Number	Area (m²)	Site Type	Nature of Site
	T5S R19E S21	35GM87	21,000	Artifact Scatter	Flakes, points, shell, faunal remains, cores, manos, pestles, hammerstones, metate
	T5S R19E S30	35SH62	46	Open Site	Housepit
	T6S R19E S8	OR-05-0710	1,500	Artifact Scatter	Flakes, scraper, flaked cobbles
		OR-05-0719(H)	7,050	Architectural Structure	Barn, sheds, pens, fences, troughs, lumber, cement, window glass, stove, bedframe, gates, wire nails, sheet metal, wire, ditch
	T6S R19E S17	OR-05-0715(H)	10,000	Artifact Scatter	Dump, wire, bottles, cans, appliances, buckets, agricultural machinery, car body, hay wagon
	T7S R19E S8	35WS24	25	Open Site	Housepit
	T9S R19E S12	OR-05-0423	800	Artifact Scatter	Flakes, point, hammerstone, biface
		OR-05-0426	900	Other	Fence, barbed wire, corral
	T9S R20E S6	35JE67	60	Shelters/Cave	Metate, flakes, cobble tools
		35WH48	6	Shelters/Cave	Pictograph flakes
	T9S R20E S30	35WH28	540	Artifact Scatter	Mano, flakes, core
	T9S R21E S30	OR-05-0707	10,800	Artifact Scatter	Flakes, cores, biface, point
South Fork John Day	T16S R27E S20	CR-0R-02-798	2,400	Artifact Scatter	Flake, uniface
		CR-0R-02-799	-	Artifact Scatter	Flakes, bifaces, points, Elko Gatecliff, Northern, Uniface, Scraper

to the other prehistoric sites in the vicinity: shell middens 35SH98 and 35SH99 and artifact scatter 35SH101. In general, the interpretive exhibit could focus onexplaining the prehistory of the Deschutes River Basin. Two additional possible approaches might be taken regarding the focus of the interpretive exhibit. First, Site 35SH23 might be used as an example of how artifact collection destroys the public's cultural heritage. Alternatively, site 35SH23 might be rehabilitated in much the same manner as 35SH33 (Lebow and Pettigrew 1989b). Either treatment also can be part of an experimental study to assess the effects of such an interpretive exhibit-in-place on the frequency and scope of site disturbance by artifact collectors.

Fourteen sites are located along or near a hiking trail on the east bank of the Deschutes River opposite the Warm Springs Reservation. This trail runs from the Gateway Recreation Area and Trout Creek Campground to the Warm Springs Bridge. Sites in the vicinity of this trail, which is basically an old railroad bed, include shell middens, artifact scatters, open sites with housepits, and rock feature sites with talus pits and rock cairns. Currently only minimal facilities such as toilets and trash receptacles are along the trail. Depending on any future improvements to the trail, interpretive exhibits at either or both ends of the trail might help increase the public's understanding of and appreciation for the area's prehistory. Again, as was the case with Macks Canyon, the exhibits also might be part of an experimental study to assess the effects of such an interpretive exhibit-in-place on the frequency and scope of site disturbance by artifact collectors. Because of their proximity to the Warm Springs Indian Reservation, interpretation of these sites should be integrated with possible requirements of the socio-cultural use category (see discussion below).

Other sites at recreational facilities along the Deschutes River include sites 35SH94 and EA-10 near the Beavertail Recreation Area, Site 35SH92 at the Pine Tree Boat Launch, Site

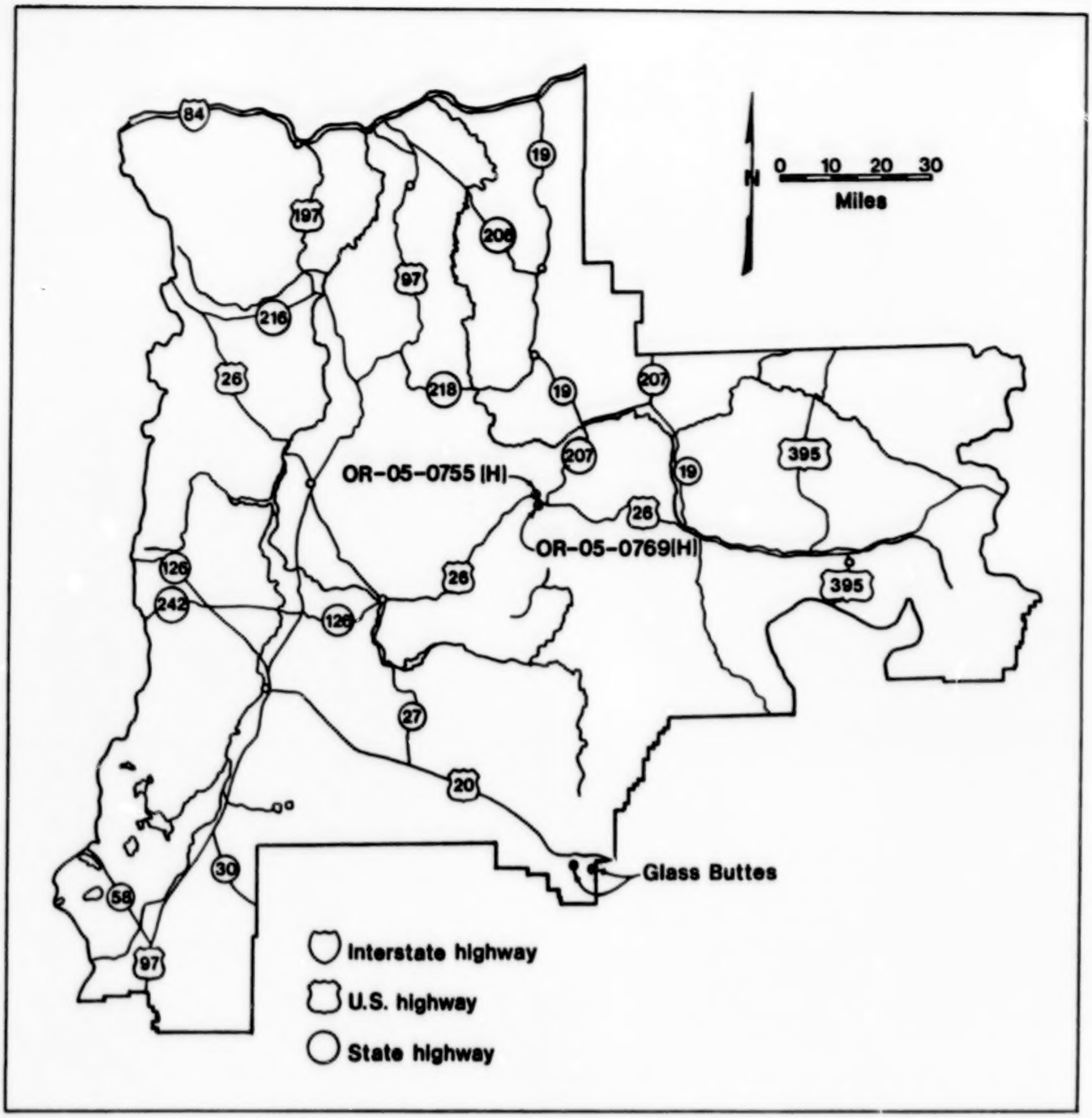


Figure 5.2. State and Federal Highways Considered when making Provisional Assignments to the Public Use Category.

35WS57 at the Blue Hole handicapped fishing facility, and sites 35WS112 and 35WS113 near Trout Creek Campground. These also are potential candidates for public use.

The second criterion for public use assignment is proximity to Wild and Scenic River corridors. In all, 111 prehistoric and historic sites are located within the Lower Deschutes

Table 5.4. Candidate Sites Near State or Federal Highways for Provisional Assignment to the Public Use Resource Category.

Route	Legal Location	Agency or SHPO Number	Area (m^2)	Site Type	Nature of Site
US20	T18S R13E S23	OR-05-0770(H)	36,210	Engineering Structure	Road
	T19S R14E S13	OR-05-0275	225	Artifact Scatter	Dump, cans, stove pipe, glass, leather
	T20S R16E S11	OR-05-0718	1,000	Artifact Scatter	Flakes
	T22S R21E S26	OR-05-0353	225	Artifact Scatter	Flakes, uniface, biface
		OR-05-0354	50	Artifact Scatter	Flakes, point, Elko
		OR-05-0359	323,208	Artifact Scatter	Flakes, unifaces
		OR-05-0627	285,000	Artifact Scatter	Flakes, metates, point, uniface, biface, pecked cobble, pail, cans, bottle, glass
	T23S R22E S6	OR-05-0327	6,000	Artifact Scatter	Flakes
	T23S R22E S7	35LK278	1,200	Artifact Scatter	Flakes, biface
		35LK279	300	Artifact Scatter	Flakes, biface
		35LK280	300	Artifact Scatter	Flakes
		35LK281	64	Artifact Scatter	Flakes, core
		35LK282	100	Artifact Scatter	Flakes, scraper, biface, utilized flake
		35LK283	360,000	Artifact Scatter	Flakes, scraper, biface
	T23S R22E S9	35LK337	800	Artifact Scatter	Flakes
		35LK338	3,000	Artifact Scatter	Flakes, uniface
		35LK342	540	Artifact Scatter	Flakes
		35LK343	100	Artifact Scatter	Flakes, uniface
		35LK344	11,880	Artifact Scatter	Flakes, uniface
		35LK357	15,000	Artifact Scatter	Flakes, point, Humboldt
		35LK358	20,000	Artifact Scatter	Flakes, scraper, bifaces
	T23S R22E S10	35LK332	2,100	Artifact Scatter	Flakes, metate
		35LK354	1,800	Artifact Scatter	Flakes
		35LK356	2,000	Artifact Scatter	Flakes, biface
		35LK359	48,000	Artifact Scatter	Flakes, scraper, point
		35LK361	600	Artifact Scatter	Flakes
		35LK362	50,000	Quarry	Flakes
		35LK363	800	Artifact Scatter	Flakes
	T23S R22E S11	35LK360	300	Artifact Scatter	Flakes
	T23S R23E S13	35LK374	2,000	Artifact Scatter	Flakes, point
		35LK377	35,000	Artifact Scatter	Flakes, scraper
		35LK376	400	Artifact Scatter	Flakes, biface
		35LK375	-	Artifact Scatter	Flakes, bifaces, point
	T23S R23E S14	35LK338	15,000	Artifact Scatter	Flakes, uniface, biface
US97	T15S R13E S21	35DS173	1,250	Shelters/Cave	Flakes, points, sagebrush sandals
	T22S R10E S1	OR-05-0319	750	Architectural Structure	Cabin, boards, nails, pits, dump, cans, glass, bottles
	T23S R10E S8	OR-05-0599(H)	6,870	Engineering Structure	Irrigation canal
	T23S R10E S10	OR-05-0038	70	Architectural Structure	Structure, wood
		35DS231H	2,700	Architectural Structure	Cabin, wood, nails, hole-in-top cans, dump, glass, ceramic, privy metal, stove parts, flakes, biface
	T23S R10E S17	OR-05-0624(H)	1,206	Engineering Structure	Canal, headbox, lumber
US26	T11S R21E S27	OR-05-0755(H)	350,000	Engineering Structure	Ditches, dam, headbox, aque- duct, flumes, corral, cement, rock alignment, lumber, pipe, culvert, wire nails, wire, rebar, bottle glass, ceramic
	T11S R21E S34	OR-05-0769(H)	10,000	Architectural Structure	Structure, corral, metal, glass, ceramic lumber, metal sheeting, rock foundation, wire nails, bottles, jars, stove parts, cans, car parts, dumps
	T12S R24E S5	OR-05-842(H)	1,350	Artifact Scatter	Flakes, flaked cobble, knives, shotgun shells

Table 5.4. (Continued).

Route	Legal Location	Agency or SHPO Number	Area (m^2)	Site Type	Nature of Site
OR126	T15S R12E S14	OR-05-0792	60,000	Artifact Scatter	Flakes, point, bifaces, glass, cans, ceramic, leather, license plate
		OR-05-0796(H)	10,000	Engineering Structure	Ditch, wooden header box, wire drawn nails
	T15S R12E S15	OR-05-0793(H)	100	Artifact Scatter	Cans, bottles, china, caps, shoe parts, glass
		OR-05-0794(H)	100	Artifact Scatter	Jars, bottles, cans, ceramic, glass
		OR-05-0795(H)	100	Artifact Scatter	Cans, wire mesh, bottles
OR27	T17S R16E S35	OR-05-0619(H)	-	Other	Juniper blazed trees
		OR-05-0620(H)	-	Other	Juniper blazed trees
		OR-05-0621	100	Other	Juniper structure, point, Desert, flakes
OR206	T1S R19E S30	35GM54	198	Open Site	Housepit
		35SH58	6	Shelter/Cave	Flakes
		35SH59	23	Shelter/Cave	Metates, flakes, faunal remains
		35SH60	23	Shelter/Cave	Flakes, shell, faunal remains
	T1S R19E S31	35SH57	15	Shelter/Cave	Metate, flakes, faunal remains
		050-HS-7	2	Burial	Grave, cairn
OR207	T8S R25E S3	OR-05-0702(H)	22,500	Architectural Structure	Cabin, dump, collapsed log structure, lumber, log, window glass, tarpaper, cardboard, cloth, privy, bottle glass, jars, ceramic, metal, car parts, cans, stove pipe, rifle casings, rubber, fence posts, barbed wire, square nails, wire nails

Wild and Scenic River Corridor, 13 within the Upper Deschutes Wild and Scenic River Corridor, 79 within the Main Stem John Day Wild and Scenic River Corridor, and 2 within the South Fork John Day Wild and Scenic River Corridor (Table 5.3). All of these sites, because they are within regular public view, have potential for assignment to the public use resource category. Many of them have been or are currently being disturbed by artifact collectors. These include several open sites with housepit features (35SH91, 35WS10, 35WS42, 35WS46, 35WS50, 35WS72, and 35WS89) which might be treated in public and management manners similar to that suggested for Site 35SH23 at Macks Canyon.

Finally, public use would seem appropriate for some sites near highways. Fifty-eight sites, all of which offer potential public interpretation possibilities, are located near state or federal highways (Table 5.4). Of particular potential is a complex of sites along US Highway 20 near Glass Buttes, including artifact scatters and quarries. Interpretive treatment of these sites offers a range of possibilities from simple interpretive signs placed along the side of the highway to interpretive trails linking various sites, especially those in T23S, R22E, sections 9 and 10, representative of the obsidian quarrying and reduction process used by prehistoric peoples. Selection of an interpretive scheme depends on an assessment of the potential for thereby increasing illegal artifact collection, and on the capacity of the BLM to monitor the sites. An obsidian quarry/reduction interpretive trail would not only be of interest to the general public but also would offer educational opportunities to local schools and to archaeological programs at colleges and universities.

Two large historic sites along US Highway 26 also offer particular interpretive potential. Site OR-05-0755(H) is an extensive engineering structure site perhaps representative of

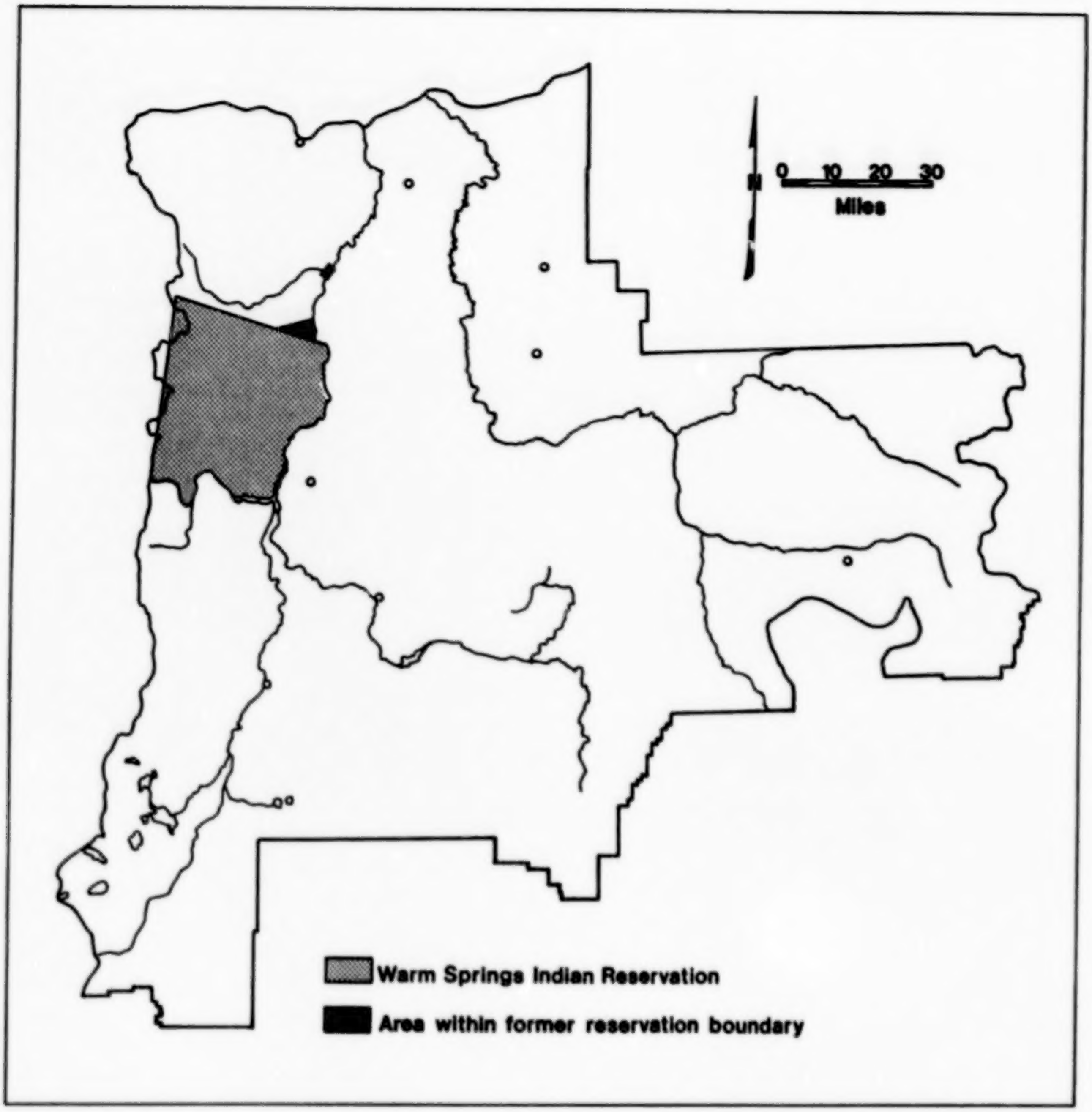

N
0 10 20 30
Miles
▨ Warm Springs Indian Reservation
■ Area within former reservation boundary

Figure 5.3. Locations of Existing and Former Warm Springs Indian Reservation Boundaries.

historic irrigation systems. Site OR-05-0769(H) is an architectural structure site perhaps representative of Euro-American homesteads.

The Oregon Trunk Railroad Stationmasters Quarters in Maupin is another documented but not fully recorded historic site with interpretive potential. Much recreational traffic passes through Maupin. Therefore, despite the absence of a site form, we provisionally assign the Stationmasters Quarters to the public use category and suggest that it be developed as an interpretive center with emphasis on railroads and early Euro-American settlement. Additional coverage of prehistory and other aspects of the region's history may also be appropriate.

SOCIO-CULTURAL USE

According to BLM specifications (Bureau of Land Management 1988), cultural properties assigned to the socio-cultural resource use category include those "perceived by a specified social and/or cultural group as having attributes which contribute to maintaining the heritage or existence of that group." Candidate sites provisionally assigned to this category include (1) all sites with burials, both historic and prehistoric, (2) sites within the former (and more extensive than present) boundaries of the Warm Springs Reservation (Figure 5.3), (3) sites along the east bank of the Deschutes River proximal to the Warm Springs Reservation, (4) sites in the vicinity of the Sherar's Falls summer fishing area, and (5) sites located in areas currently known to the BLM as areas for traditional subsistence activities. In all, 43 candidate sites are assigned provisionally to the socio-cultural use category (Table 5.5). Although BLM maintains a file for locations with contemporary subsistence importance to Native Americans, the ARCSITE database file lacks sufficient information to identify sites within traditional Native American hunting, gathering, and fishing areas. It might prove useful to correlate the ARCSITE database file with BLM's file for Native American gathering sites.

Currently the only subsistence resource area used by Warm Springs people and known to the BLM is in the vicinity of the Crooked River. A search of the ARCSITE database files indicated that no sites have been recorded for the sections concerned.

Prior to advancement of identified candidate sites into the socio-cultural resource category additional data should be gathered, and evaluations made. Steps to be taken should include discussions with people from the Warm Springs Indian Reservation concerning their knowledge of traditional subsistence resource areas and localities of direct historic importance to their heritage. BLM officials should conversely convey to Warm Springs representatives their commitment that archaeological sites receive proper management treatment. Attempts should focus on building a sense of mutual trust and respect concerning traditional resource use areas. In particular the BLM should develop mechanisms by which these traditional resource use areas, once identified, can be protected and maintained for the Warm Springs people. In addition, site evaluations according to National Register criteria under 36 CFR 60.4 can help identify candidate sites within a temporal range which reasonably could be expected to allow direct historical links to the Warm Springs people. Archival and records research can aid in this regard, as well as help to assess candidate historic burial sites.

Table 5.5. Candidate Sites For Provisional Assignment to the Socio-cultural Use Resource Category.

Reason	Legal Location	Agency or SHPO Number	Area (m²)	Site Type	Nature of Site
Within old Warm Springs boundary	T6S R14E S19	35WS75	15	Shelters/Cave	Shell, faunal remains
	T6S R14E S21	EA-34	150	Architectural Structure	Structure, stove, bed springs, sheet metal, wire nails
	T6S R14E S28	35WS74	140	Shelters/Cave	Shell, faunal remains
Deschutes River border with Warm Spring	T7S R14E S17	35WS79	80	Shelters/Cave	Battered cobbles, ground cobbles, milling stones, shell, knife, faunal remains, flakes
		35WS80	1,500	Artifact Scatter	Shell, milling stones, flakes, cores, battered cobbles
		35WS88	3,000	Open Site	Shell, flakes, drill, battered cobble, housepits
		35WS91	1,500	Open Site	Point, knife, battered cobbles, pestle, flakes, shell, housepits
		35WS92A	150	Midden	Shell, cracked cobbles
		35WS92B	150	Midden	Shell, flakes
	T7S R14E S20	35WS90	1,225	Open Site	Housepits, flaked cobbles, shell
	T7S R14E S29	35WS89	12,000	Open Site	Housepits, flaked cobbles, shell
	T9S R14E S7	35JE81A-E	20,000	Rock Feature	Talus pits, cairns
	T9S R13E S12	35JE87	360	Rock Feature	Talus pits
		35JE88	16	Rock Feature	Talus pit
		35JE90	9	Rock Feature	Talus pit
	T9S R13E S13	35JE63	50,000	Rock Feature	Talus pits, cairns
	T9S R13E S14	35JE86	150	Midden	Shell
	T9S R13E S15	35JE84	180	Midden	Shell
		35JE85	2	Midden	Shell
	T9S R13E S20	35JE80	450	Artifact Scatter	Flakes, shell
		35JE82	600	Midden	Shell
	T8S R13E S4	35WS101A	700	Midden	Shell, flakes
		35WS101B	400	Midden	Shell, flake
		35WS101C	320	Midden	Shell, flake
		35WS102	100	Artifact Scatter	Flakes, shell
		35WS104	125	Rock Feature	Talus pits
		35WS106	400	Open Site	Housepits, shell, flakes
	T8S R13E S5	35WS103	15	Artifact Scatter	Cobble mortar, mano, flakes, shell
	T8S R13E S9	35WS100	-	Midden	Shell
	T8S R14E S10	35WS99	400	Artifact Scatter	Flakes
	T8S R14E S21	35WS105	1,615	Open Site	Hammerstone, housepits, flakes, shell
		35WS112	15	Midden	Shell
		35WS113	3,000	Midden	Shell, flake
	T8S R14E S29	35WS94	2,500	Open Site	Housepits, mano
Near Sherar's Falls summer fishing area	T3S R14E S35	35WS34A	90	Artifact Scatter	Flakes, core chopper, shell
		35WS34B	20	Open Site	Housepit (?)
		35WS111	6	Artifact Scatter	Cores, flakes
	T4S R14E S9	35WS55	800	Open Site	Flakes, shell
	T4S R14E S17	35WS56	800	Midden	Shell
Burials	T1S R15E S31	050-HS-7	2	Burial	Grave, cairn
	T13S R12E S21	35JE52	217	Shelters/Cave	Burial, matting, petroglyphs, shell
	T17S R14E S35	OR-05-478	2	Burial	Grave, headstone, marker
	T19S R14E S24	35DS35	-	Open Site	Flakes, bone, hammerstone, burials, pictographs

CONSERVATION FOR FUTURE USE

According to BLM specifications (Bureau of Land Management 1988), this category is "reserved for any unusual cultural resource which, because of scarcity, a research potential that surpasses the current state of the art, singular historic importance or architectural interest, or comparable reason, is not currently eligible for consideration as the subject of scientific or historical study which would result in physical alteration." Because of the lack of information in the ARCSITE database files, the primary criterion used to assign sites provisionally to this category involved the uniqueness or scarcity of a particular site type within the entire BLM Prineville District, particular plant communities, or particular sub-basins. These sites are listed in Table 5.6.

Some examples of these candidate sites provisionally assigned to the future use resource category include the following. Site 35WS69 is the only rock art site in the ARCSITE database recorded in a grassland plant community. Site 35CR290, an artifact scatter, is the only site in the database recorded with a marsh as its secondary landform. Site 35DS337 is a shelters/cave site, and the only site in the Lower Crooked River sub-basin with shell. Site 35JE64, another shelters/cave site, is the only site in the Middle Deschutes River sub-basin recorded with ground stone artifacts. Site 35CR16 is unique in that it is one of only three recorded prehistoric architectural structure sites in the BLM Prineville District. This site reportedly has juniper house structures and flakes.

Prior to advancement of candidate sites into the future use category, the ARCSITE database should be updated so that the uniqueness of a site can be determined to be real or simply a by-product of the presently incomplete data. Parallel to this effort, how definitions of landforms and plant communities were applied to a candidate site should be examined to ensure that the uniqueness of a candidate site is not simply the result of ambiguities in the terms used. Further, an evaluation should be made of candidate sites according to National Register criteria (36 CFR 60.4).

CONCLUDING COMMENTS

Assignment of candidate sites to resource use categories has, of necessity, been provisional due to the lack of data in the site database upon which to assess the appropriateness of the various categories for a site. Indeed, the primary prerequisite to such assessments is an evaluation of sites according to National Register criteria (36 CFR 60.4). Further, BLM personnel more familiar with local conditions and the various management activities concerning recreation, timber harvest, livestock grazing, and similar activities, should assess the various competing or complementary management uses for sites and the locations they occupy.

Table 5.6. Candidate Sites With Unique Characteristics for Provisional Assignment to the Future Use Resource Category.

Agency or SHPO Number	Legal Location	Site Type	Nature of Site	Uniqueness
35SH100	T2S R14E S13	Rock Art	Pictograph	Only rock art site with secondary landform = River
35WS35	T3S R14E S26	Rock Feature	Cairns, biface	Only rock feature site with secondary landform = River
35SH90	T3S R14E S35	Rock Art	Pictographs	Only rock art site with secondary landform = Bench
35SH85	T3S R15E S9	Quarry	Flakes, shell	Only quarry site with secondary landform = Bench
35GM40	T4S R18E S11	Rock Art	Pictographs, petroglyphs	Only rock art site with primary landform = Mesa
35WS94	T8S R14E S29	Open Site	Housepits, mano	Only open site with primary landform = Hill
35WS67	T5S R13E S12	Open Site	Housepit	Only open site with secondary landform = Stream
35WS69	T5S R13E S25	Rock Art	Pictograph, flakes, shell, knife	Only rock art site with plant community = Grassland
35WS78A	T5S R14E S7	Rock Feature	Talus pits, cairn, quarry, cores, flakes, biface	Only rock feature site with secondary landform = Bench
35WS103	T8S R13E S5	Artifact Scatter	Cobble mortar, mano, flakes, shell	Only artifact scatter with secondary landform = Swale
35WS100	T8S R13E S9	Midden	Shell	Only midden site with secondary landform = Bench
35WH6	T8S R20E S12	Shelters/Cave	Pictograph	Only shelters/cave site with secondary landform = Hill
OR-05-0424	T9S R18E S2	Rock Feature	Cairns	Only rock feature site with secondary landform = Cliff
OR-05-0425	T9S R18E S12	Shelters/Cave	Cairn, charcoal, flakes	Only shelters/cave site with secondary landform = Ridge
35JE215	T10S R19E S29	Rock Art	Pictographs	Only rock art site with secondary landform = Bluff
OR-05-0175	T10S R24E S10	Rock Feature	Cairn	Only rock feature site with secondary landform = Rim rock
35JE64	T13S R12E S33	Shelters/Cave	Flake, shell, hopper mortar	Only site with ground stone with Middle Deschutes River subbasin
35DS337	T14S R13E S3	Shelters/Cave	Points, Windust, Cascade, bone awls, bone point, shell, charcoal, flakes, groundstone, pictograph, petroglyph	Only site with shell with Lower Crooked River subbasin
35CR382	T15S R16E S26	Rock Feature	Rock semi-circle	Only prehistoric rock feature with Lower Crooked River subbasin
OR-05-0468	T16S R17E S21	Quarry	Flakes, raw material, bifaces, points, Elko	Only quarry site with plant community = Western Juniper Zone
OR-05-0020	T17S R13E S8	Artifact Scatter	Flakes	Only artifact scatter with primary landform = Badlands
OR-05-507	T17S R16E S9	Other	Juniper lean-to, flake	Prehistoric architectural structure
OR-05-621	T17S R16E S35	Other	Juniper structure, point, Desert	Prehistoric architectural structure
35DS45	T19S R13E S14	Rock Art	Pictographs	Only rock art site with Lower Crooked River subbasin
35CR16	T19S R18E S4	Architectural Structure	Juniper house structures, flakes	Prehistoric architectural structure
OR-05-0063	T19S R18E S18	Shelters/Cave	Flakes, knife	Only shelters/cave site with Upper Crooked River subbasin
OR-05-0223	T21S R19E S2	Rock Art	Petroglyphs	Only rock art site with Upper Crooked River subbasin

Table 5.6. (Continued).

Agency or SHPO Number	Legal Location	Site Type	Nature of Site	Uniqueness
35CR290	T21S R22E S1	Artifact Scatter	Flakes	Only artifact scatter with secondary landform = Marsh
OR-05-326	T23S R22E S12	Shelters/Cave	Flakes, faunal remains, point, uniface, dump, cans, biface	Only shelters/cave site with primary landform = Rolling Plains
35LK337	T23S R22E S15	Quarry	Flakes, bifaces	Only quarry site with secondary landform = Cliff
35LK382	T24S R22E S12	Quarry	Flakes, point, bifaces	Only quarry site with secondary landform = Hill
35LK310	T24S R23E S30	Rock Feature	Rock alignment, flakes	Only rock feature site with primary landform = Rolling Plains

6. SUGGESTIONS FOR FUTURE RESEARCH

Investigations of cultural resources conducted by the BLM in the Prineville District are done for three fundamental reasons. Most practically, the BLM carries out studies (inventory, evaluation and data recovery) to meet federal regulations and criteria (such as the Archaeological Resources Protection Act of 1979, 36 CFR 60.4, and so forth) designed to protect cultural resource sites from the effects of federal undertakings. A second reason for such work is the desire by the agency to develop a better understanding of the resource base so as to improve its management effectiveness. Finally, and perhaps least clearly defined though of far-reaching importance, the agency has a responsibility to share the knowledge potential and other values of its cultural resources with the scientific community and with the public. A common basis for these three reasons is the information value of cultural resources. Potential knowledge about human events, conditions, and cultural processes is an important characteristic that prompts our society to adopt a protective attitude toward the fragile traces of the human past.

Such knowledge about past human cultures is available only through research, an enterprise that depends upon the critical examination of evidence and ideas. Whether for compliance purposes or for purely scientific, problem-oriented studies, research follows a path that should begin with an understanding of those research domains that are of concern to investigators. Particularly for evaluations of National Register eligibility, consideration of the research issues approachable by available cultural resource data is critical. Unless a site (particularly a prehistoric site) can be shown to contain data applicable to important research issues, it usually cannot be determined eligible.

Beyond compliance issues, the development of research domains is an integral part of a unified scientific approach to the interpretation of cultural resources. Through such organization of thought, individual investigators can focus their energies and contemplation on problem areas generally deemed worthy of attention. Lists and discussions of research topics also represent benchmarks of investigative progress, standards for professional work, and points of departure for future inquiry. They also are forms of communication between researchers, means of sharing ideas regarding the proper directions for future work. Augmentation of knowledge, and improvements in interpretation, about cultural resources is greatly facilitated by a process involving the regular application of well-considered research questions to recovered data, comparison of results to anticipations, and creation of a new and better informed generation of research queries.

Future research in the area of the Prineville District should be guided by such an organized set of research concerns. This chapter represents an effort to answer that need by the suggestion of a series of topics and associated hypotheses. Although adapted to the research potentials of BLM lands within the Prineville District, the questions discussed here inevitably apply as well to other properties in the vicinity, and to some extent adjacent areas.

Presented below is a series of topical areas, each encompassing a variety of possible research questions. Each topical area begins with a short discussion of the subject, followed by potentially testable hypotheses and additional problems for which such hypotheses cannot yet be framed. Because the state of knowledge on north-central Oregon still is rather poor, our ability to frame concrete hypotheses is seriously limited. In areas where knowledge of past cultures is more complete, hypotheses normally are more easily generated, because more facts are known about which interpretive hypotheses may be asked. Thus, in the area of the Prineville District, questions are easier than hypotheses to come by.

Following the presentation of research topics is a brief summary of the kinds of cultural resource sites known or thought to be present on the District, in the context of the research potentials they possess, and a consideration of the methods and approaches that might be applied to recover and examine important data. Site types and methods are both viewed in the light of the research topics listed in this chapter.

RESEARCH TOPICS

Many of the research topics listed below are familiar particularly to experienced archaeologists and historians. This presentation may differ in some important regards from earlier treatments, especially in its emphasis on overarching theoretical concerns, as represented by the first two topics introduced, "Social/Political/Economic Complexity" and "Proposed Model for Regional Cultural Evolution." These broad theoretical topics, introduced first, have ramifications on many of the diverse topics subsequently presented, and form a backdrop against which other subjects can be viewed. Furthermore, some of the research hypotheses and questions covered here might fit into more than one topical area, but are placed with the topics thought to be most pertinent. For these reasons, hypotheses suggested by or relating to the first two topics are presented with the ensuing issues to which they especially apply. Issues of particular relevance to ethnography and history are given their own topical areas.

SOCIAL/POLITICAL/ECONOMIC COMPLEXITY

Aboriginal cultures in the study area ranged from some of the most sophisticated and complex (e.g., Chinookans at The Dalles) to some of the simplest (Central Oregon Paiutes) recorded in western North America. This cultural diversity can be considered as a testing ground for important questions relating to the levels of complexity reached by hunter-gatherers, and the causes for this complexity or lack thereof. The features that characterize complex hunter-gatherers can be used as measures of degrees of complexity in different areas, and are listed below as summarized by Price and Brown (1985:10-13):

1. More complex technologies include larger tallies of material items, and more intricacy in the fabrication of some items.

2. Complex hunter-gatherers typically intensify their subsistence economy through the exploitation of a diversity of species and habitats, and by investment of greater effort in a few staple foods. Particularly important in this regard in north-central Oregon were anadromous fish, deer, roots, seeds, and possibly freshwater mussels.

3. Increased sedentism is reflected at key sites by longer annual, and even permanent, use as opposed to shorter-term, seasonal occupations.

4. Settlements become larger and more internally structured.

5. Territories become more specifically identified with particular groups, and marked more often by special symbols and inter-group confrontation. Such symbols may include rock art; stylistic embellishments of baskets, projectile shafts, other perishable items, and stone sculpture; and potentially even styles of projectile points.

6. Critically important to complex hunter-gatherers is the use of stored foodstuffs, requiring the development of appropriate techniques and technology for gathering, processing, and storing.

7. Trade is carried out in greater volume and through more far-reaching networks. In north-central Oregon, the obsidian trade is most prominent archaeologically, but other commodities were traded as well, some perhaps even more important to the economy than obsidian.

8. Complex hunter-gatherers tend to adopt standard mediums of exchange, such as the dentalium shells distributed throughout the Pacific Northwest, or the obsidian bifaces of Central Oregon discussed by Scott et al. (1986).

Although, as noted above, the ethnographic picture of the study area reveals great differences in complexity, ethnographic data south of the Columbia River, particularly in Central Oregon, are quite weak, and the prehistoric mosaic still is open to conjecture. The complexity measures suggested by Price and Brown (1985) create a method by which archaeological data can be used to compare prehistoric societies in the region.

PROPOSED MODEL FOR REGIONAL CULTURAL EVOLUTION

Questions concerning degrees of hunter-gatherer complexity are of less interest by themselves than when they are placed in an explanatory context. Some of the most important questions to be asked in any region concern explanations for perceived trends in cultural development. In north-central Oregon such questions are quite pressing, yet difficult to ask in detail because of a serious lack of hard data concerning what actually happened in prehistory. Perhaps ironically, this very lack of data increases the appropriateness and usefulness of models that might predict patterns encountered by future investigation. Because prehistoric culture change is so poorly known in the study area, the region can constitute a new "case study" in which concepts suggested as general explanations for cultural evolution, and even as predictions of the evolutionary patterns eventually to be found, can be tested afresh.

The explanatory model of regional cultural development suggested in Chapter 3, *Synthesis and Interpretation of Cultural Resource Data*, shows some promise of accounting for and predicting archaeological patterns in north-central Oregon, and is offered as a hypothetical framework by which to organize and examine existing data and those yet to be gathered. The principal elements of the model, which can be arranged into four gross temporal periods, are summarized below. These periods are (1) Paleo-Indian (12,000-10,500 B.P.), (2) Early Archaic (10,500-7000 B.P.), (3) Middle Archaic (7000-2000 B.P.), and (4) Late Archaic (2000-contact).

For the **Paleo-Indian** period (12,000-10,500 B.P.), the proposed model adopts the suggestions of Kelly and Todd (1988). Paleo-Indian sites in western North America tend to be small, low in artifact density, and limited in assemblage diversity, and contain lithic raw materials in the form of large bifaces instead of cores or nodules. People at this time existed in small bands at the family level of sociocultural integration, and subsisted substantially on herds of large mammals, particularly mammoth and large bison. Such specialization was successful for a time, near the end of the Pleistocene, when these animals were a reliable resource over large geographic areas. An alternative strategy, dependance on local plants and smaller mammals, was not followed because it would have required detailed knowledge of the locations and annual cycles of such biota within delimited localities. Bands of fluted-point hunters pursued herds of large mammals that could be found year-round in many regions that otherwise might have had very distinct environments and ecosystems. Such foraging demanded frequent travels to keep contact with migrating herds, and resulted in low population density, rather infrequent re-use of particular base camps and other site types (including butchering localities and raw material sources), reliance upon large bifaces as primary tools and as mobile stores of lithic raw material, and a social structure based on the small band. Within the Prineville District, the herds on which Clovis hunters depended might have been most abundant in grassland environments, including the Deschutes-Umatilla Plateau, the broad flats of Central Oregon near Madras and Redmond, and on the vast High Desert south of the Maury Mountains; and near the forest margins, such as on the perimeters of the Blue Mountains and Newberry Caldera and on the eastern slope of the Cascade Range.

Human populations during the succeeding **Early Archaic** period (10,500-7000 B.P.) were forced to adapt to the decline and disappearance of the large herd animals (especially mammoth, large bison, and horse), and to expand their subsistence base to include more locality-specific resources (still largely animals) whose exploitation required more detailed knowledge of resource characteristics. Foraging continued, but in smaller territories, and the beginnings of a logistical system appeared, though not as tightly organized as in later times. Bands remained small and simply organized. In places with abundant resources, such as in the lake basins of the northern Great Basin, reduced demands for travel, improved efficiency of resource extraction, and a favorably moist, mild, and biotically productive environment caused population densities to rise dramatically. Fish were of generally limited importance, except where they were very easily harvested with a minimum of effort and technology (such as at Five Mile Rapids on the Columbia River). After 8000 B.P. use of fish on the middle Columbia River may have increased, though still not nearly to intensive levels.

Early Archaic human population densities were limited in areas where wintertime food availability was restricted, because techniques for food preservation still were not well developed. Much more than in later periods, locations of occupation sites may have been limited by the seasonal presence of animal food resources. Greatest site densities should be found where faunal resources were abundant during all seasons. Such possibly was the case for the Great Basin portion of the District, where waterfowl and remaining herds of large mammals might have combined to provide plentiful food throughout the year. Low-elevation areas along the Columbia River might have provided some subsistence security through a combination of fish, waterfowl, small mammals, and large mammals. Human populations may have been very limited or absent in areas without ponds and marshes, salmon streams, or suitable grazing. Most upland areas might have fallen into this category, except those places with exceptional seasonal concentrations of special resources, such as game herds.

Early Archaic tool assemblages are not expected to vary much from site to site, because of the limited specialization of the technology and the simple settlement system. Food-grinding and specialized fishing tools were absent, or nearly so. Except possibly in terms of faunal remains, functional distinctiveness of sites should be low. Houses should be difficult to find, because houses probably were light and easily dismantled to allow frequent moves by small foraging groups.

The most significant adaptive changes appear to have occurred during the **Middle Archaic** (7000-2000 B.P.), in response initially to a distinctly drier mid-Holocene climate that finally put an end to large herd animals, vastly reduced the productivity of lowland wetlands, and might have limited salmon runs as well. These changes rendered the previous adaptive mode untenable, and stimulated development of techniques to hunt solitary game animals with notched projectile points, to invest in the labor-intensive and expanded use of dryland seeds and roots, processed most efficiently with grinding stones, and where salmon was available to spend more time fishing. Thus, more intensive food-collection practices were combined with new harvesting and processing technology to create a new economy characterized by stored foods (such as dried or smoked fish, and pulverized and dried seeds and roots) and a logistical system with a central home base. Such a system allowed permanent occupation of areas that previously were marginal because of seasonal scarcity.

The most fundamental adaptive changes had already taken place by 5000 B.P., when Schalk (1987) proposes that the first pithouse settlements begin to appear in the foothills of north-central Oregon. By that time the climate had begun to ameliorate, improving the productivity of the landscape and the degree of success of the new lifeway. The first pithouse sites would have been small, inhabited by small family units, and dependent upon resources gathered and processed by these residents. Such sites are thought to exist within the Prineville District at locations favorably placed for root gathering, hunting and salmon fishing. These places are not generally on the Columbia River, but rather mostly in the interior, within close range of upland hunting grounds, such as on the northern flank of the Ochoco Mountains, at the base of the Cascade Range near the lower Deschutes River, or in the Deschutes and John Day canyons, where winters are mild. Within striking distance of these home bases, satellite seasonal camps would have been located in important resource areas, particularly where abundant game animals and roots could be found.

As proposed by Schalk (1987), the success of this lifeway led eventually to substantial population increase, which in turn stimulated intensification of subsistence activities to support the growing population. In the salmon areas, fishing would have produced the greatest return on the intensification investment, and was increasingly emphasized, so that by 3000 B.P. it had become a much more important part of the economy. Habitation sites had spread northward toward areas with substantial fall runs, especially along the middle Columbia River and the lower reaches of the Deschutes and John Day rivers. The population-intensification "spiral" continued to, and past, the end of the Middle Archaic.

South of the productive salmon area, as to the north, the model predicts the development of a logistical system based on stored foods, but resources suitable for intensification appear to be absent. Nevertheless, even here winter habitation sites probably appeared during the Middle Archaic, and should be found eventually in sheltered lowland locations with access to winter herds of deer or sheep as well as to important root- and seed-gathering grounds. These sites, like the resources on which they depended, should be dispersed over the landscape, and should be rather small, reflecting the limited resource base.

Although the **Late Archaic** (2000 B.P.-contact) probably saw no fundamental shifts in cultural adaptation, the process of intensification on the Columbia Plateau that began in the

Middle Archaic is thought to have continued and peaked well past 2000 B.P. As suggested by Schalk (1980), the very large villages on the middle Columbia River with more than 100 housepits likely represent the highest levels of intensification achieved, and depended very much on large salmon harvests taken with the most developed fishing technology to be found prehistorically. South of the salmon area, where intensification may not have been a useful strategy, the model would predict no essential changes in adaptive mode.

A. CHRONOLOGY

Temporal ordering, an essential building block of archaeological interpretation, is a critical need in north-central Oregon, although the cultural sequence of Dumond and Minor (1983) for the Wildcat Canyon Site and the John Day Reservoir area represented an important start. For the most part, however, chronological placement of sites and components in the study area depends on cross-dating (usually based on projectile points) with adjacent areas. Even the Dumond and Minor (1983) sequence is based only on one site, has large gaps, and is yet to be confirmed with other data. Obsidian hydration dating has wide applicability and potential, yet is virtually absent from investigations thus far.

HYPOTHESES

A1: The human presence in the study area will not be shown to predate 12,000 B.P. Confirmation of this hypothesis may take many years, during which efforts should be made to locate natural deposits of greater age in places where human occupation might be anticipated.

A2: Within the area swept by the Spokane Flood (s) (Bretz et al. 1956; Waitt 1980) near the Columbia River, this catastrophe removed evidence of human occupation older than about 10,500 B.P. Post-Flood deposits, whether cultural or natural, should date within the past 10,500 years.

A3: A logistically organized settlement system centered on pithouse occupation sites and dependent on stored foods existed on the Columbia Plateau (i.e., the northern portion of the Prineville District with productive salmon streams) by 5000 B.P., marked by pithouses, the mortar (including the hopper mortar) and pestle, mano and metate, earth ovens, stone boiling, and storage pits in house floors.

A4: Salmon fishing has existed since earliest times, but intensive salmon fishing, as marked by specialized fishing technology (such as net weights, fish clubs, fishhooks, and toggling harpoon points) did not appear until about 3000 B.P.

A5: The first "villages," defined as occupation sites with at least 10 contemporaneously occupied pithouses, appeared on the Columbia Plateau at about 3000 B.P. or later.

A6: The bow-and-arrow, as proposed by Pettigrew (1981), appeared in the Prineville District between 2500 and 2000 B.P. This technology is marked by narrow-necked (7 mm or less) projectile points.

A7: Euro-American trade goods (such as beads, metal artifacts, etc.) began to appear in the study area after about A.D. 1750, as indicated by the known use periods of the items themselves.

ADDITIONAL PROBLEMS

For most of the District, hard data on basic temporal facts such as the periods of use of distinctive projectile point types simply are not available. Other kinds of artifacts, such as stone sculpture and stylistically variable perishables, can be useful chronological markers as well, but they need to be identified and associated with objective dates. Geomorphic sequences, particularly in key areas such as the Deschutes and John Day canyons, are necessary to provide temporal control and to inform on the availability of terraces and other surfaces of particular ages. Potentially great advantage for archaeological chronology could be taken of the multiple volcanic deposits of various ages, including Mazama ash and many others, in Central Oregon (Davis and Scott 1986). For all chronological periods, attention should be directed toward obtaining more samples of cultural materials for objective dating, including charcoal or other organic matter for radiometric analysis, and obsidian for hydration rind measurement. Establishing obsidian hydration rates in various parts of the District will advance archaeological research more than perhaps any other single measure, but will take a concerted and coordinated effort to chemically characterize all of the available obsidian sources and associate them with objective dates within climatic zones. Other dating methods, as yet untried, are available also, such as thermoluminescence, which theoretically can provide age estimates for heat-treated CCS materials, which are common in north-central Oregon. Another method to be pursued with more vigor is seriation of projectile points, which for this purpose must be collected in greater quantity than has typically be done in the region.

B. SETTLEMENT/SUBSISTENCE

Issues of settlement and subsistence patterns in the Prineville District at present may be even less tractable than those of chronology, partly because chronology itself is poorly developed, but also as a result of the lack of hard data on well described site types and their distribution. With some notable exceptions (e.g., Armitage 1983), settlement system models have been lacking, and surveys designed to address settlement issues are rare (an exception is that of Lyman et al. [1983]). Few sites have been excavated, and most of those not completely described. Altogether, some of the most basic kinds of research are in their infancy.

HYPOTHESES

B1: Clovis sites, when they are found, will tend to be found on the Deschutes-Umatilla Plateau (though absent from areas swept by the Spokane Flood), in the open terrain of Central Oregon, or in the lowland portions of the Great Basin. These sites, which will be rare, should show little inter-site variability in functional indicators (features, faunal and floral remains, and flaked lithic debris).

B2: Sites of the Early Archaic will be much more numerous than those with fluted points, but concentrated in places, usually near bodies of water, where year-round animals resources were available, such as in the Great Basin and in low-elevation areas near the Columbia River. Where base camps or occupation sites are found, their assemblages will tend to vary from place to place more in terms of locally available faunal remains than in tools found. Grinding tools should be rare and limited to manos and metates, largely used for grinding pigment rather than seeds. Except in rare places such as The Dalles, salmon fishing should not be substantially represented in faunal collections until after 8000 B.P.

B3: A fully logistical system, characterized by seasonal camps and extraction sites in the full range of ecozones, did not come about until methods and technology for collecting and processing storable foods were developed. Thus, some of the sites that were part of that system in its earliest incarnation should contain grinding tools, house features, storage pits, earth ovens, and triangular, notched projectile points for arming true projectiles (as opposed to lance points for thrusting spears).

B4: Only in conjunction with specialized fishing gear (such as net weights, fish clubs, fishhooks, and toggling harpoon points) should we find exceptionally large villages alongside the arid middle Columbia River.

B5: In general, the extent of specialized resource-extraction technology found in prehistoric sites should be inversely related to the age of the sites. That is, the older sites will have the less specialized technology.

B6: Sedentary communities dependent on the triad of salmon, large game, and roots existed in the Deschutes River drainage at some time(s) as far south as the mouth of the Crooked River (near the upriver extent of substantial salmon runs).

B7: South of the productive salmon streams, pithouse sites will be found to be small and widely scattered over the landscape, though located within reach of the winter ranges of deer and sheep as well as root-collection grounds. Such sites more likely exist on private land, in the more well watered and productive lowlands, than on land retained by the BLM and Forest Service.

B8: Within the salmon area, the most important foods prior to the Middle Archaic were animal resources, primarily land mammals. The Middle Archaic diet was a more balanced mix of land mammals, roots and salmon. By Late Archaic times, especially on or close to the middle Columbia River, salmon had gained importance at the expense of land mammals and roots. South of the salmon area, the pattern was similar, except that, in Middle Archaic times and later, seeds played a role alongside roots, salmon never constituted a dependable resource, and waterfowl in the Great Basin had special importance during the Early Archaic. Testing these notions will rely upon preserved food remains, chemical analyses of human bone such as measures of the $^{13}C/^{12}C$ ratio, residue analyses, and inferences from tool assemblages.

B9: Small homestead sites composed of extended families only, and marked by groups of only one to four pithouses, were a common settlement type in the Middle and Late Archaic, especially in the tributary canyons of the lower John Day and lower Deschutes river drainages.

B10: Even at sites where fishing is very likely or otherwise evidenced, fish bones (most efficiently recovered in fine mesh screens) should be a minor part of the faunal assemblage.

Even so, sites where fishing was intensive should produce significantly larger fish bone collections than those where fishing was a minor activity. Independent confirmation is possible through correlation with fishing tools, availability of fish in the site vicinity, and possibly through residue analyses of tools and chemical tests of human bone.

ADDITIONAL PROBLEMS

The list of research approaches in this category is almost endless. Questions abound regarding the range of site types to be found in given regions and their distributional tendencies, the seasonal round, and the archaeological manifestation and confirmation of the ethnographic cultural pattern. Sites with possible housepits now are recorded in the Ochoco Mountains (such as at Big Summit Prairie), and confirmation of the housepits and the place of such sites in the settlement picture are interesting problems to be addressed. Within sites lie important questions, such as: Can we identify activities and activity areas? What activities can we infer from features, including houses? Can we determine the contemporaneity of houses in village sites? Similarly, the concurrent occupation of sites is a problem to be resolved as a way of measuring regional populations.

Settlement nucleation is an important issue, spawning questions concerning its origins, causes and consequences. For example, was nucleation influenced more by salmon runs or by improvements in plant food collection, processing and storage? How do we define the "village"? What is the size of the catchment area for pithouse sites?

Questions about the diet are of great importance. One might ask about the relationships between anadromous fish availability and cultural adaptations. What systematic cultural differences correlated with the different kinds and seasons of fish runs in various streams? How did cultures in salmon areas differ from those where salmon was unavailable? With regard to food resources in general, correlations should be sought between environmental zones exploited and particular resources collected. Closely related is the issue of associating floral and faunal remains with seasons of exploitation. These problems can be connected with widely recognized universal theories of hunter-gatherer adaptions (e.g., Jochim 1976, 1979). A complicating factor, but one to be addressed, is the degree to which local food collection was supplemented by trade in food items. If trade involved food items, in what direction was food traded? Can we find evidence for the ethnographically documented trade of food (Anastasio 1972)?

A separate question, but one unavoidable given our knowledge of site types (see Chapter 4), is the role of the "lithic scatter" in the settlement system. A variety of functions seem likely to be represented, but what were they? Examination and close comparison of such sites seems warranted to resolve this problem, since they outnumber all others.

C. TECHNOLOGY

Technological change in prehistoric North America has long been thought to have been very limited, and of little importance in explaining cultural shifts, but opinions of this kind appear to be reversing. Evidence is accumulating that technological innovation not only took place, but had remarkable effects on cultural adaptation over the past 10,000 years. Dealing with matters of changing technology, however, requires establishing the basic facts about when and where certain innovations were introduced and how they diffused, as well as the actual functioning of the tools and the technical ramifications of their use. Such information in north-central Oregon for the most part is yet to be gathered, and a database of technological facts is yet to be established. Even so, plenty of ideas sufficient to mold hypotheses have been generated by work here and in other regions.

HYPOTHESES

C1: The lithic raw material chosen for tool types is closely related to the functional requirements of the tool. For example, projectile points and bifacial cutting tools are made of lithic materials on which formal control is relatively easily accomplished, and which produce a very sharp edge. Hide scrapers and drills are made of materials with these qualities, but require also a material (usually CCS) that is not extremely brittle. Uses of tools can be inferred through their form, context of discovery, wear and breakage patterns observed, and residues on their surfaces.

C2: Some of the most frequently used lithic tools were not modified much if at all, but were simple flakes of the proper size and shape for the task at hand. Use of such tools can be inferred by the same means as for formed lithic tools.

C3: As proposed by others (Renfrew 1977; Pettigrew and Spear 1987), many attributes of lithic raw materials at prehistoric sites are functions of the distance from raw material source. Among these attributes are the relative proportions of material from particular sources, the weight of material from sources, the size of waste flakes of particular materials, and their functional uses. In the Prineville District, these economic relationships will be best reflected in obsidian, which varies greatly in its availability from abundance in the south to near absence in the north.

C4: Obsidian sources in north-central Oregon exist both in the upper Deschutes (Central Oregon) and the upper John Day river (Ochoco Mountains and ranges to the east) drainages. Obsidian distributions are governed by the river systems, such that obsidian in the lower Deschutes River area comes mainly from the upper Deschutes area, and that found in the lower John Day River vicinity derives from the Ochoco Mountains sources.

C5: The functions of tools can be identified through examination of wear patterns and residues on their surfaces. These data will tend to confirm each other and interpretations made through formal and contextual considerations.

C6: Most lithic scatters were used for a variety of purposes that should be reflected in use traces. Sites without such traces should be rare.

C7: A microblade industry will be recognized in the Columbia Plateau portion of the District for the early part of the Middle Archaic period (ca. 7000-4000 B.P.), as it has been in adjacent regions (Sanger 1968).

C8: Clusters of cultural debris in surface lithic scatters can be identified and related to separate occupational episodes (Pettigrew 1983).

C9: Housepit floors tend to contain storage pits with traces of cached food remains.

C10: Early Archaic sites on the margins of playas in the Great Basin tend to yield crescents, which were used as blunt projectile points to hunt waterfowl.

C11: The introduction of the horse in protohistoric times had important effects on cultural patterns, including expanded trade networks, adoption of mobile house structures in place of the fixed pithouse, and coalescence of populations into fewer, larger settlements.

C12: The introduction of the bow-and-arrow at about 2000 B.P. or shortly before resulted in a noticeable change in the use of lithic raw materials. The smaller points used to arm the arrow required the reduction of relatively small flakes, compared to the larger flakes and cores needed to manufacture atlatl darts. Thus, whereas in earlier times acquisition of suitably-sized cores and flakes often required long-distance trade, suddenly smaller-size, more local, materials were suitable. Archaeologically, this shift is recognizable in an apparent change to provincialism in raw material selection, though actually the cause is economic and stimulated by technological change.

ADDITIONAL PROBLEMS

Can different lithic reduction techniques be identified, and associated with tool types, raw materials, ethnic traditions, or chronology? How do debitage attributes relate to the frequency and intensity of site use, and to taphonomic factors? What kinds of perishable materials are preserved to inform us about the greater part of technology that was not lithic?

D. SITE FORMATION PROCESSES

Wide recognition finally exists of the importance of understanding the processes that created and shaped the physical remains found in archaeological sites. In north-central Oregon, however, little attention has been directed at such issues in the interpretation of the few excavated sites on record (for an exception, see Pettigrew 1982). Research clearly needs to be directed at detailing the kinds of post-depositional processes that pertain to regional sites, as well as the cultural and natural processes that contributed to the original depositional patterns. Geomorphological research will take a leading role in addressing this problem area.

HYPOTHESES

D1: Mazama tephra has buried and preserved many early sites in Central Oregon, and in specific places to the north.

D2: Sites older than 4000 B.P. will be difficult to find in the Deschutes and John Day canyons because of erosion of alluvial terraces, but some early Holocene terrace remnants may contain older traces of human activities.

D3: Surfaces now exposed in the Great Basin portion of the District are quite ancient, and contain traces of human land use as early as the late Pleistocene.

ADDITIONAL PROBLEMS

What climatic changes have occurred to cause alluviation or erosion of sites? What have been the impacts of large-scale irrigation projects on prehistoric sites in Central Oregon and elsewhere?

E. PALEOENVIRONMENT

Discussions above for both settlement/subsistence issues and site formation processes have alluded to the environment as a causal factor. Desperately needed in north-central Oregon are paleoenvironmental studies to provide independent evidence of the patterns to which cultures had to adapt. Recent contributions by Reid et al. (1989) in the Blue Mountains represent a start in this direction, but much more must be done to illustrate the climatic sequences of the various and distinct regions, such as Central Oregon, the middle Columbia River, the Ochoco Mountains, the Deschutes-Umatilla Plateau, and the canyonlands of the Deschutes and John Day rivers. Importantly, this research must be separate and independent of archaeological data, so as to avoid the circular reasoning that archaeologists sometimes fall prey to.

HYPOTHESES

E1: The general tripartite division of Holocene climates (with much variation also within finer intervals) will be recognized in north-central Oregon as elsewhere in the West.

E2: Particularly prominent in the geomorphic data from the major river canyons will be evidence of the Neopluvial moist interval between about 4000 and 2000 B.P. At that time average stream discharge was greater than at present, soils stabilized and developed, and salmon habitat was in its most favorable Holocene condition.

E3: The Mazama ashfall caused a serious decline in the human land-use intensity of Central Oregon.

E4: The Newberry eruptions and others in Central Oregon had similar effects as the Mazama ashfall, but to a much smaller scale and degree.

E5: Plants that produce edible roots and seeds, so important aboriginally in north-central Oregon, respond favorably to the improved moisture conditions of humid climatic intervals.

ADDITIONAL PROBLEMS

Many problems exist to cloud our understanding of the complex environmental interactions that mediate basic (such as climatic) environmental changes and the effective environment for human beings. What are the ideal conditions for dryland root plants? How do these plants respond to harvesting? Can we expect that areas where they are plentiful today were the same in prehistoric times? Similar questions may be asked about past fluctuations in salmon populations. If the mid-Holocene saw seriously lowered streamflows, then were salmon populations in the major rivers depleted so much as to affect the salmon harvest? Is this factor an important cause of the resource intensification that apparently took place in the late Middle Archaic and the Late Archaic?

Particularly in Central Oregon, the environmental conditions preceding the Mazama ashfall are very poorly understood. Soils may have been better developed than at present, biotic diversity and productivity may have been better, and the Early Archaic may have been a time of plenty for human populations, but so far these are purely speculations. Related to this topic are general questions about the factors that governed the availability of land mammals, obviously a very important resource aboriginally, particularly in the southern half of the study area. What factors govern population levels of important prey such as deer, bighorn sheep, and elk, and can we estimate general population levels for prehistoric times through informed models of ancient environments? Similar questions may be asked about waterfowl, which may have been unusually abundant during the early Holocene in the northern Great Basin.

Another topical area, seldom discussed but probably of greater relevance than commonly thought, is that of aboriginal burning practices. Burning of certain areas was practiced by at least some peoples to foster particular kinds of resource productivity (see ethnographic discussion in Chapter 3). Can we identify aboriginal burning in the archaeological or paleoenvironmental record? Can we distinguish natural fire patterns from those created by people? Do fires increase in frequency with the arrival of humans on the landscape, or later with increasing land use intensity?

F. DEMOGRAPHY

By demography we mean the general subject of human population size and fluctuation, rather than the strict definition of human vital statistics. So far no estimates exist for the numbers of pithouses, or pithouse sites, occupied in given regions during particular periods. Such basic data would be useful to examine population fluctuations and associate them with potential explanatory factors. Additional data categories for this purpose are shell and other food residue accumulation, and burials. Campbell (1989), for example, used several of these indices to isolate a period of probable population decline in eastern Washington during the early 1500s, which she attributed to epidemic disease. Another method for indirect assessment of populations would be to compute the mass of lithic raw material consumed during specific periods.

HYPOTHESES

F1: Human populations in the areas of the District with salmon streams increased markedly after 5000 B.P., and especially after 3000 B.P. South of the salmon area populations stabilized by 3000 B.P. and held steady thereafter.

G. IDEOLOGY

A difficult topic to address with archaeological data, ideology nevertheless is reflected in features such as rock cairns and burial disposition, and in symbols represented in ornamentation and rock art. Rock cairns, their types and distributions are yet to be studied seriously, and the other pertinent data types similarly lack sufficiently organized treatment.

Hypotheses in this category are difficult to frame on the basis of present knowledge, but a number of questions can be posed. We might ask, for example, about the antiquity of the vision quest pattern, which appears to be reflected by rock cairns placed on high ridges and prominences. Can we date these cairns, in relative or objective terms? Also, if the vision quest was not a part of Northern Paiute ideological practices, then are rock cairns absent south of the salmon area?

H. CULTURE HISTORY

Culture history concerns questions about what happened in prehistory, particularly as regards particular peoples and events. Such are not issues of culture process, but bear an important relation to culture process in that the "what" questions logically precede questions of "how" and "why." In north-central Oregon, however, culture history thus far has been approached only generically, through reified constructs such as culture areas, rather than in terms of actual culture-historical issues applicable by the direct historical approach. For example, we know something about the peoples of north-central Oregon as described ethnographically (see Chapter 3), but we can point to no direct links thus far established between specific sites and specific groups of people. For the most part, even careful consideration of archaeological finds in terms of ethnographic data still is rare in archaeological reports.

Particularly problematic, as it tends to be everywhere, is the identification of ethnicity in the archaeological record. Such identification requires the isolation of factors that are not easily explained by other causes. Potentially productive characteristics to observe for this purpose are items possibly containing ethnically specific symbols, such as rock art, styles and embellishments of perishable artifacts such as baskets and projectile shafts, non-technological, stylistic attributes on projectile points and other tools such as fishhooks, and art objects. Patterns of lithic raw material distribution might be useful as ethnic markers if such patterns could be shown to violate predictions made on the basis of economic considerations (particularly distance from source).

HYPOTHESES

H1: An ethnic boundary existed prehistorically in the Deschutes River drainage between the Tenino (and their predecessors) in the salmon area on the north and the people (last represented by the Northern Paiute) of Central Oregon. This boundary should be located approximately at the mouth of the Crooked River.

H2: The ancestors of the Northern Paiute entered north-central Oregon from the south within the last 1000 years.

H3: As proposed by Dumond and Minor (1983), the middle Columbia River area saw an influx of coastal or Lower Columbia cultural traits (such as "pin stem" projectile points) at about 2000 B.P.

ADDITIONAL PROBLEMS

Culture-historical problems tend to be very particularistic, and, for those who tend to see culture in terms of process rather than events, often difficult to separate from purely processual issues. Also, many of the questions raised above under "Chronology" might be seen as culture-historical, and in fact are both. Beyond such topics already discussed, one might ask about archaeological linkages to ethnographic and existing peoples. Can we really associate archaeological remains with particular groups of people, and how far back can we trace the connection? Can we establish certain Deschutes or John Day River sites as specific, named ethnographic settlements? Also, can archaeological data be used to clarify what the ethnographic Columbia Plateau cultural pattern really was, or to take the place of the absent ethnography of Central Oregon? What is the time depth of conflicts between Sahaptins and Northern Paiutes? Is it reasonable to ask whether Central Oregon "affiliates" with the Plateau or Great Basin culture areas? Is it not best to recognize that this region was neither "Columbia Plateau" or "northern Great Basin," but transitional between them, and that transmuted manifestations of both culture areas are to be expected in Central Oregon's prehistoric record? Finally, what antiquity can be established for the trading patterns ethnographically documented (Anastasio 1972).

I. EXCHANGE/EXTERNAL RELATIONS

The movement of goods between areas can be identified archaeologically by the discovery at particular locations of items confirmed to come from other areas. Most frequently, discussion of this topic archaeologically is limited to lithic raw materials, which are nearly universally present and often derive from sources at a distance. In north-central Oregon, lithic sourcing clearly is in its infancy, and is an area with great growth potential. Hypotheses regarding obsidian are presented above under "Technology." Other kinds of materials, such as coastal shell or non-flakable stone such as pumice and nephrite, should exist in places as well, and are potentially good indicators of exchange patterns. Furthermore, in some cases preserved food remains might evidence exchange of food items.

HYPOTHESES

I1: The proposed intensification of the past several millennia in the northern portion of the Prineville District, and the concomitant increase in sociocultural complexity, resulted (as would be predicted by Price and Brown [1985]) in the increased importation and variety of exotic items.

I2: This increase in sociocultural complexity also should have expanded the use of standard mediums of exchange. Specifically, we would expect an increase in the number of dentalium shells found in archaeological contexts.

J. GENDER AND THE ORGANIZATION OF LABOR

Tasks in most societies are assigned by gender. Reference to ethnographic data suggests ways by which labor was organized by gender-related principles. We may infer that artifacts and features in prehistoric sites reflect the spatial organization of engendered tasks. Such investigation in north-central Oregon has yet to begin, though appropriate evidence for it certainly is available. Gender-specific artifacts and features may include lithic debitage, milling stones, projectile points, end scrapers, food waste deposits, midden soils, and hearths.

HYPOTHESES

J1: Habitation sites should show more distinct gender-related patterning than short-term camps.

J2: Some short-term camps were male-dominated (e.g., hunting camps), and some were female-dominated (e.g., root-gathering and berrying camps).

K. ETHNOGRAPHIC ISSUES

In the ethnographic discussion of Chapter 3, three current areas of research--cultural ecology, network analysis, and ethnohistory--were cited. All have been productive of several papers in the recent past, and promise to be so in the future as well. As the time for productive research with informants knowledgeable about "aboriginal" or early contact period native culture is fast drawing to a close, alternate lines of evidence about past life-styles must be considered, as well as inspection of data collected in earlier years with new problems in mind. Sociocultural anthropology, along with archaeology, is moving beyond the stage of particularistic collecting and preliminary classification of data by categories influenced by Western thought, to consideration of how things fit together--functionally, systemically, through time, in the natives' eye, and so on. Thoughts on future research in this area do not lend themselves to hypothesis-formation. Instead, presented below is a list of present research trends, and a few new directions of our own.

1. More cooperation among archaeologists, sociocultural anthropologists, and ethnohistorians is needed.

2. We expect a continuation of the trend in sociocultural anthropology to collect and codify local Native American knowledge about the environment (flora, fauna, geography, ecology), or "Ethnoscience." Recent works by David French and Eugene Hunn are examples.

3. Researchers are paying increased attention to the ethnohistorical record, until recently virtually untapped for north-central Oregon. Two forthcoming publications from the Oregon Historical Society Press (Boyd n.d. and Stern n.d.) will deal with Hudson's Bay Company and missionary records from the region.

4. More emphasis on culture as a system of parts which interact and influence one another is needed. The recent article by Boyd and Hajda (1987) is an example of this kind of work. Interaction among cultures and societies at various time periods also needs more investigation. The work of Anastasio (1972), Brunton (1968), and Hajda (1984), which use the network analysis approach, could well be updated or expanded to include the north-central Oregon study area.

5. More studies, ethnological, ethnohistorical, and archaeological, should investigate the role of culture traits (especially items of material culture) in cultural systems. "Artifacts," for instance, should be viewed as more than types (classified by form and/or function), but as part of a greater, interactive whole. A given article of material culture, for instance, may be made of raw materials with a limited distribution and require special techniques for its manufacture; its presence may increase efficiency of exploitation and alter traditional patterns of social interaction. Papers by Haines (e.g., 1960) on the impact of the horse and by various archaeologists on technological innovations underlying the regional shift to pit-house dwelling (see Chapter 3) are examples of this kind of work.

6. Although a few studies have focused on the effect of infectious diseases resulting from White contact (Boyd 1985; Hunn 1990), additional research should help elucidate the resultant changes in aboriginal demography, social structure, settlement patterns, and ideology.

7. A significant body of work exists describing the nativistic religions that emerged in the mid-1800s. One avenue of continued research in this regard is contemporary Native American religion; the ongoing syncretistic process needs further investigation.

8. More studies are needed to investigate the cultural changes resulting from the material culture introduced at contact. While the effects of the introduction of the horse are often discussed (cf. Nelson 1973), many other items (such as agriculture, cattle, tools, and clothing) probably also affected aboriginal cultures.

L. HISTORICAL TOPICS

The development of historical themes and contexts in north-central Oregon has proceeded at an even slower pace than that for prehistoric archaeology, possibly because fewer historians than archaeologists are actively engaged in regional research. Further study of the rich corpus of historical data, however, should rectify the present weakness in investigative orientations. Even now a number of research hypotheses can be offered, largely relating to issues of land settlement and development.

HYPOTHESES

L1: The homesteading system worked against the small farmer, and to the benefit of speculators and empire-builders (Gates 1979). Archaeological and documentary evidence will reveal that a disproportionate number of family homesteaders failed when compared to non-family filed homesteads.

L2: Climate and poor precipitation have been blamed correctly for numerous settlement failures. Prior to the development of irrigation, the rate of homestead failure was a function of climate.

L3: Community support may have been instrumental in the success of the homestead. We would expect a higher incidence of homestead success where community support was available.

L4: Because government agencies tended to favor large over small landowners, large homesteads were more likely to succeed than small homesteads.

L5: Recorded homestead entries will not exactly correspond to the actual physical evidence of settlement. Thus, archaeological evidence will be an important measure of the accuracy of archival data.

L6: The earlier historic sites are apt to be fairly close to roads.

L7: The very early settlement of north-central Oregon, and the earliest settlement patterns, were governed by the occurrence of gold. Settlements directly related to gold deposits include (1) mining communities, (2) roads, (3) troop garrisons, and (4) farms and ranches that supplied the mines.

L8: With the discovery of summer fallowing, the use of irrigation, and precipitation that was often just enough to get by on, settlement flowed after 1880 into virtually every setting in Central Oregon.

L9: Agriculture and settlement increased after the transcontinental railroad was completed in 1883. Subsequently, national economic considerations increased in importance to Central Oregon settlement patterns.

L10: Early mining camps, more frequently than logging camps, developed into more permanent communities.

L11: Logging camps and early mining camps were predominantly male-oriented (with little evidence of families); the structure was simple and varied relatively little between different locations.

L12: Settlement patterns, household layouts, artifact assemblages, and mining technology during periods of active gold mining varied with the ethnicity of the miners.

L13: During the initial placer mining period from 1860 to the 1880s, mining settlements were more dispersed, household layout and social structure simpler, and mining technology different than during the later period of underground mining in the 1890s.

L14: With the completion of the transcontinental railroad to Portland, and railroad access into north-central Oregon, settlement patterns became more dispersed, and home type, household layout, and artifact assemblages became more diverse.

L15: Homesteads established during the time of conflicts between sheep herders and cattle ranchers, circa 1890 to 1905, will show more defensible characteristics vis-a-vis location and layout than those established previously.

ADDITIONAL PROBLEMS

Yet more questions may be asked about land settlement and use. For example, what is the relationship between the land entry method used and the natural characteristics of the land? What is the status of the land now? The identities of the filers? Their place of origin? The size of their families? What did they actually build and do on the land? To answer such questions, investigation might be done through examination of title plats and township entries, as well as by historical archaeology to "ground-truth" the archival data. Mining and logging are two other historic themes important in the history of the Prineville District, both of which would benefit from archaeological approaches (to supplement and test the existing written literature). In adjacent regions, archaeology of mining and miners has been receiving considerable attention (cf. Hardesty 1988; Price 1987; Zeier 1987; Zeier and Speulda 1987), but, other than site recordation and documentation, is absent in north-central Oregon, even though mining was very important in the history of the area. Similarly, archaeology of logging and logging communities is non-existent in the Prineville District.

SITE TYPES AND RESEARCH POTENTIALS

The discussion presented above should make it abundantly clear that all types of cultural resource sites have research value of some kind. In truth, our curiosity about human behavior in all of its expressions is so much greater than the apparent capacity of the available archaeological and archival record to satisfy it that few traces of past human activity are seen as less than precious. In this context, classification of sites into types is less important than determining what facets of human behavior the sites represent. Nevertheless, for a variety of reasons, including site inventory, land management, and scientific investigation, site type designations have utility.

Site types can be viewed from two opposing perspectives. The discussions in this chapter so far have viewed them from a theoretical and behavioral perspective, so that terminology used has been functional. We have spoken of "village" sites, and "base camps," and "root-gathering camps," for example. In reality, archaeological sites are not readily so grouped, because site function usually is an inference rather than a recordable fact. Practical archaeological site types are those defined in terms of hard evidence, that is, objects, features and other observable characteristics.

The vast majority of prehistoric sites recorded on the Prineville District, as detailed in Chapter 4, are what often are termed "artifact scatters" or "lithic scatters," because the most obvious evidence of human use is the lithic debris found on or in the ground. Other descriptive site types, such as rockshelters or caves, quarries, and "open sites," usually possess scatters of lithic debris also, but have other characteristics (in those cases rock overhangs, naturally occurring lithic material, and housepit features) that allow a less generic classification. Even midden sites, rock features, and rock art sites often are associated with lithic debris concentrations. Most prehistoric sites, then, appear to have lithic debris, but only in a minority of cases does surface inspection reveal other characteristics to allow more refined grouping. Almost certainly, as pointed out above, undifferentiated lithic scatter sites were used for a wide variety of purposes, many of which might be revealed through careful investigation.

This consideration suggests that great care should be taken in estimating the research potential of sites on the basis of their classified types. Most sites with sufficient quantities of lithic debris, particularly when taken as a group, and as suggested by the discussions of topics and hypotheses above, can address a wide variety of research topics as suggested by the discussions of topics and hypotheses above, such as social/political/economic complexity, models for cultural evolution, chronology (especially for sites with obsidian), settlement and subsistence, technology (particularly appropriate), site formation processes, paleoenvironment, demography, culture history, exchange/external relations (also particularly applicable to sites with obsidian), and the engendered organization of labor. In fact, interpretations in each of these areas must be structured so as to take into account the entire range of evidence available, including evidence recorded outside the bounds of defined "sites." Lithic sites with particular functionally-related characteristics indeed can apply especially well to particular research topics. For example, sites with grinding stones can address issues concerning the development of root and seed collecting and its place in the prehistoric adaptive system (as discussed above, this issue has wider ramifications in the realm of human cultural evolution). Sites with projectile points and butchered animal remains and little else may have been hunting camps, and can inform on questions concerning the role of hunting in the aboriginal economy, and about male-dominated tasks. Some lithic sites may have special importance because of their age: sites with fluted points, as well as Early Archaic sites, even though perhaps uncomplex in their tool assemblage and lacking features, can provide evidence about, and test models for, early human lifeways. Of course, the age of most lithic scatters remains unknown, in the absence of obvious temporal indicators such as projectile points, prior to additional studies such as obsidian hydration measurement. The most important fact about lithic scatters, however, is that usually their function and chronology both are unknown prior to intensive investigation.

Less ambiguously classified sites may be easier to associate with particular research issues, though not necessarily. Rockshelters, for example, may contain no more evidence on the surface than most lithic scatters, and early guesses about function tend to be based on assumptions about the advantages of natural shelter. Another example is the "quarry" site, which though associated with naturally occurring lithic raw material need not be functionally limited to lithic procurement and reduction. Rock art sites, rock cairns, and burials are likely to facilitate investigation of ideological questions and perhaps more: rock art and burials also may contain ethnically related symbols, burial goods may include items indicative of regional exchange systems, and human remains can inform on diet, health, physical type, demographic issues, and perhaps even ethnic identity (through chemical analyses).

The most frequently mentioned site type in the discussion of research topics above is the site with housepits, variously referred to as "open site," "village," prehistoric "homestead," and "occupation site." Sites with pithouse remains vary in size, location and associations, and perhaps even in function. We tend to think of them as winter habitations, the center of the logistical settlement system, though the possible housepit sites in the Ochoco Mountains seem ill-suited for winter habitation and (if they are indeed habitation sites) may have served during some other season. The topical discussions above make it clear that pithouse sites are key to many research domains, most prominently the testing of models for the evolution of the logistical lifeway and for intensification. Such sites almost certainly possess evidence regarding each of the aboriginally-related issues listed. We should keep in mind in this connection that even some sites without depressions might have been habitation sites: Northern Paiutes reportedly used less permanent structures without pits (see Chapter 3), and we still have little idea about the forms of habitation used by Early Archaic and Paleo-Indian peoples.

With regard to historic sites, the range of available questions regarding land settlement and use suggests that nearly all site types have relevance. Most prominently mentioned are homesteads, which, like the housepit sites discussed for aboriginal peoples, were the center of the settlement system outside of the urban setting. Homesteads were part of a system that included roads, railroads, farms, ranches, mining communities, and troop garrisons. Irrigation features represent an important adaptive change in the history of settlement. In all of these cases, remnants of the representative features and associated disposed wastes are potentially important evidence of a lifeway now vanished or drastically altered.

METHODS

In the consideration of research topics above many methods were suggested or implied, and others may be useful as well to help answer important questions about the human past. While we cannot cover all possible methods here, or more than briefly mention each, a methodological summary nevertheless may serve to provide direction for those contemplating research approaches in north-central Oregon. In reality, archaeologists and other cultural resource specialists are very eclectic, and willing to adopt new methods whenever an advantage presents itself, and we expect that methods in the future will be more various and complex than those we now have in our arsenal.

One of the first steps in the investigation of any region, particularly now that federal land-managing agencies are adding dramatically to the areas surveyed for sites, should be an inventory of recorded cultural properties, conducted by review of records or an actual archaeological survey. Because of the large numbers of sites recorded in north-central Oregon and adjacent areas, computerized searches for information are the most efficient approach, though one limited by the generally poor condition of most existing databases. Archaeological surveys can be conducted in ways (Lebow and Pettigrew 1989a; Lyman et al. 1983; Pettigrew and Lebow 1989) allowing the recordation of the full range of cultural evidence, not limited to concentrations classified as "sites." Analysis of horizontal patterning within regions or surveyed areas is done best through distributional plots or tabular summaries associating different variables.

Investigation of individual sites can be done through surface inspection, remote sensing, or excavation. Surface inspection can include controlled surface collection as well as mapping and photography, to record site conditions as well as debris distributions. For some surface lithic clusters, such surface data may suggest functions as well as separate occupational episodes (cf. Pettigrew 1983). Remote sensing, through either aerial photography or such methods as proton magnetometry and ground-penetrating radar, can evidence subsurface patterning, such as locations of buried features.

Excavation, whether limited to small-scale test-excavation or more complete data recovery, results in the collection of a much broader body of data, and itself allows the application of a large battery of methods directed at data interpretation. Excavation methods can include the use of fine-mesh screens for collection of very small items such as fish bones (important to addressing the difficult question about the importance of fishing in the diet), seeds and small beads. Fine-mesh sifting and flotation processing of column and fill samples can recover small preserved food remains and other important yet tiny bits of evidence (such as the small end of the lithic debitage size scale). Soil samples can be taken for soil chemistry analysis, which can determine the extent and nature of anthropic soil modification, and thus help identify the extent and function of sites. Geomorphological examination of soil profiles provides evidence on the geomorphic processes that helped create the surface on which the site is found as well as those that may have contributed to site formation itself. Flotation and chemical analysis of soil samples taken from potential storage pits can help determine what might have been stored there. Of course, standard excavation procedures create a thorough description of the site structure, including natural and cultural stratigraphy, cultural features, and the provenience of collected items.

Analyses of excavated materials and data are potentially endless. Classification and description of tool assemblages and lithic debitage allow comparisons of strata and sites in terms of a multitude of assemblage parameters for functional and other determinations. Chronology can be determined through a variety of methods, such as radiocarbon analysis, stylistic cross-dating, obsidian hydration, stratigraphy, geomorphology, tephrochronology, seriation of projectile points, thermoluminescence, and dendrochronology. Stylistic analyses might also help address culture-historical issues. Lithic technological analysis is important to make complete use of the usually abundant lithic debris in addressing issues of site function. Such analysis can include recordation of raw material, size, and mass of debitage, as well as breakage patterns of tools and debitage. Analysis of edge wear, organic residues, and breakage patterns can help determine the uses of both formed and unformed tools. X-ray fluorescence provides chemical characterization, and thus identification, of obsidian sources. For identified raw materials, distance-from-source studies can serve to test economic models concerning the distribution and use of commodities, and perhaps suggest alternative explanations for observed attributes and distributional patterns. Analyses of faunal and floral remains generate important information about diet, harvesting practices, seasonality, and possibly even exchange patterns. Methods used by physical anthropologists for investigating human bone can provide wide-ranging evidence concerning individual life histories, demography, disease, and ethnic identification.

Beyond analysis of collected samples and objects, methods can extend into outside subjects that may bear on important archaeological concerns. For example, research into the habits of animals, and factors governing populations of animals and plants, can elucidate the probable environmental conditions to which people of the past adapted, and allow development of more precise adaptive models. Independent studies of paleoclimatology similarly can clarify the picture of ancient environments and how they might have changed. Comprehensive reference to ethnographic and ethnohistoric data can present examples of behavior that explain certain archaeological patterns, or generate behavioral analogues important to developing explanations. The direct historical approach in special cases can even identify for us the people that lived in particular sites, thus connecting the historic with the prehistoric past. Archaeological experimentation can help answer such questions as how harvesting affects root-bearing plants, or how bioturbation affects debris patterns in buried sites. Archival research, particularly for research on historic sites, and including sources such as title plats, township entries, newspapers, and unpublished manuscripts, is essential to providing an interpretive context.

As time passes, many more methods will appear to assist in the interpretation of cultural resource data. Specialists should actively search for such new methods, and perhaps even solicit suggestions from professionals in other disciplines, such as the physical sciences, that tend to develop analytical techniques of potential archaeological use. In the meantime, the probability of improved future methodology should remind us that the preservation of data in the form of preserved collections and intact sites is an ethic that has not lost its validity.

BLANK PAGE

7. *MANAGEMENT OPPORTUNITIES*

The Prineville District clearly is committed to improvement of its cultural resource management program, including creation of an automated database for sites recorded within the District, and compilation of this update of the District's cultural resource overview. This chapter presents recommendations that may help the District more effectively and efficiently manage these resources. The recommendations included here are not generic, umbrella-type suggestions, but instead are specific, detailed proposals aimed at assisting the District to continue development of its cultural resource program. The management opportunities discussed in this chapter will be presented in five sections, each pertaining to a different aspect of cultural resource management on the Prineville District. These include: (1) suggestions for upgrading the BLM ARCSITE database, (2) proposals about cultural resource inventories, (3) recommendations for managing previously recorded cultural resource sites, (4) a discussion of additional data needs, and (5) prioritized actions.

THE ARCSITE DATABASE

The BLM ARCSITE computer database is a tremendously valuable tool which allows relatively easy and efficient manipulation of cultural resource data. However, this database is not without problems; additional information can be included which will aid manipulation of the data, and thus improve cultural resource management. We believe that the following suggestions will add to the utility of the database. Our recommendations in this regard are presented under three headings: the structure itself, manipulation of the file, and miscellaneous recommendations relating to the database. Recommendations are numbered for ease of reference.

THE ARCSITE DATABASE STRUCTURE

IRI has had ample opportunity to examine the ARCSITE database, having entered over 1500 site records into the database for the BLM Oregon State Office. Based on this experience, we suggest that a number of fields be added to the ARCSITE database in order to provide information useful for managing cultural resources. At the same time, these fields should be added to the site form used in the field, thus ensuring that the site is recorded more completely.

1. Currently, the database structure is arranged in such a way that generalized prehistoric temporal periods can be indicated (i.e., Early Archaic, Late Archaic, etc.) through negative or positive responses in logical fields, if the site contains temporal indicators which allow such determinations. Similarly, the period for a site related to Euro-American use can be indicated by an affirmative response in **Lhistoric** (Late Historic). However, as noted in the caveats to the presentation of site distributions (Chapter 4, *Environmental Associations*), if a prehistoric site has no temporal indicators, then a negative response to the logical fields is implied, and no way exists to indicate that the site is prehistoric. Usually, searching the file for records for which **Lhistoric** is negative will reveal the prehistoric sites. However, for sites with both Euro-American and prehistoric components (and when the

prehistoric component has no temporal indicators), the site will be in the database only as a Euro-American site, thus masking the prehistoric component. The solution is simple: add a logical field which can be used to indicate if the site is prehistoric, or has a prehistoric component. Prehistoric temporal periods still could be indicated in the existing logical fields.

2. Along the same lines, a field should be added to designate the ethnic group responsible for the site (i.e., Native American, Euro-American, Chinese, etc.). Obviously, there are Native American sites (such as traditional or ceremonial use areas) and other non-Euro-American sites which fall within the **Lhistoric** period. Such sites may have special significance due to research issues such as socio-cultural changes (see discussion in Chapter 5, *Resource Use Categories*), and may require different management strategies. Presently, there is no easy way to derive this information from the database.

3. **Sitetype** should be changed to allow multiple site type entries for a single site. As discussed in the provisos for the site distribution analyses (Chapter 4, *Environmental Associations*), sites with complex structures or multiple components are forced into a single site type, when several different "types" may actually be present in the same locale. Currently, a site with a midden, a lithic scatter, a rockshelter with rock art, and an historic structure must be indicated as a single site type. Each of these facets of the site tells us something about subsistence and settlement patterns, but this information is not easily retrieved from the database. We recommend that **Sitetype** be changed to a series of logical fields, each denoting a different site type. In this way, multiple site types can be indicated easily, and the distribution of sites will be more accurately represented. In addition, the choices of site types for historic sites are too general, and thus do not allow specific information to be easily derived. As discussed in Chapter 2 (*Data Reliability*), we suggest that the historic site types become more functionally related. Architectural structure sites could become homestead sites or structures not related to homesteading (such as logging camps or mining cabins). Engineering structures could be replaced with roads, railroads, canals, ditches, and other engineering-related sites. In this manner, the site type may reveal a great deal about the site, without requiring a search through the site form.

4. Currently, there are different criteria applied among different recorders when deciding whether or not a concentration of lithic debris constitutes a site (see discussion in Chapter 2, *Data Reliability*). The BLM should standardize a definition, and ensure its use by all recorders working for the BLM (both contractors and BLM employees). Furthermore, a field denoting debris density should be added to the database; such a field would be very useful from a research perspective, allowing investigators to compare sites in terms of a very basic descriptive parameter.

5. Four fields should be added to denote raw material types present at prehistoric sites; each entry would be a percent, indicating the relative proportions of raw material types (obsidian, CCS, basalt, and other). Sites with different material types have different research potentials (e.g., obsidian sourcing is not possible in a site without obsidian). This parameter is a very important avenue for site comparisons.

6. **Integrity** would be more useful if it were two fields. One of these would indicate the integrity of the surface component, and the other would indicate the integrity of any subsurface component. A site may have a very disturbed surface assemblage, but contain

relatively intact subsurface deposits; thus, the site still may be likely to yield valuable information. If the integrity of subsurface deposits is unknown, then the latter field could be left blank.

7. Currently, if a site has less than 100% integrity, it is not possible to determine from the data base the force(s) responsible for disturbing the site. We suggest adding a field for the purpose of describing impacts to the site (i.e., vandalism, construction, grazing, etc.). This information will be useful when assigning sites to resource use categories, determining necessary stabilization measures, and for ascertaining administrative land-use actions necessary to protect the sites.

8. Two fields relating to current land use would be useful for management purposes. One would indicate current land use (selected from a list of land use options, such as grazing, recreation, or commercial timber production) of the site. Such a field would serve to suggest the types of ongoing and future impacts to the site, and would be useful also when assigning sites to resource use categories (see discussion in Chapter 5, *Resource Use Categories*). The second field, which also would serve primarily as a management tool, would indicate the site's location within a special resource area, such as a wilderness area or an area designated as a Wild and Scenic River corridor.

9. The final recommendation concerning alteration of the ARCSITE database structure is to add a memo field so that the reference noted in **Reference** can be included as part of the database. As it is now, **Reference** has little purpose, since the database does not indicate in what document(s) the site is mentioned. This memo field can be used to document the project in which the site was recorded, as well as for denoting other sources of information in which the site is referenced.

THE QUALITY OF THE DATA

The utility of a computer database is directly related to the quality of the data included in the file, and to the ease with which the data can be manipulated and extracted. If the data within the database are incomplete, inaccurate, or difficult to retrieve, then the utility of the database is diminished (the axiom "garbage in--garbage out" is old, but still very true). The following recommendations pertain to ways in which the value of the ARCSITE database can be increased by improvements in data quality.

1. Our first recommendation is of a general nature. In order for the information in a database to be useful, data must be correctly and consistently recorded and entered. It serves no purpose to have multiple soil designations for similar soils (such as discussed in Chapter 4, *Environmental Associations*, where over 100 different soil designations negated the use of soil as an environmental variable). Recorders must be able to accurately describe the soil, plant communities, landforms, and other variables listed in the database. Two ways are suggested to ensure that data are consistent and correct. First, only qualified people should be allowed to conduct archaeological surveys. Second, the manual for the ARCSITE database should be re-written to be much more explicit. The current manual has no definitions for the various landforms or site types, therefore leaving these entries to the imaginations of the various recorders. The manual should include, or provide references to, soil and plant community descriptions which are in detail sufficient

that recorders can accurately identify these environmental variables. The recorder name is another area with needless variation; multiple designations for the same individual creates problems when attempting to sort site records by recorder. Individuals should not use different versions of the same name (e.g., Joseph Smith should not alternatively use Joe Smith and J. Smith).

2. Many of the sites entered into the database lacked key information, often including what we consider even minimal locational data (see Chapter 2, *Data Reliability*). Other pertinent fields (such as **Aspect** and **Slope**) are also frequently left blank. The National Register status was not included on any of the site forms, although we know that certain sites are either on the National Register, or have been formally determined eligible (see discussion below). All sites previously recorded, especially those recorded before 1980, should be re-visited, and the information in the database updated; if data are missing, they should be added. If re-visiting sites is not possible, then missing locational information should be derived at least from maps.

3. While working with both the database and survey reports describing specific sites, we observed that the information in these two sources often did not match (see Chapter 2, *Data Reliability*). We recommend that, for those cases in which a survey report exists, the data in the report be compared with those in the site forms.

4. As discussed in Chapter 4, *Environmental Associations*, a number of the environmental variables used to discern site distributional patterns are areal in nature, and therefore are ideally evaluated in terms of site densities (numbers of sites per unit area). A major factor for such a statistical summary is the amount of BLM land, and particularly the amount of land surveyed, within each areal variable. Unfortunately, this information is not available at this time.

   To help remedy this problem, we strongly suggest that the Prineville District implement a GIS (Geographic Information System). Data in this system should include the acreage (or some other measure of area) of each environmental variable by basin, sub-basin, elevational interval, and physiographic province, thus allowing actual densities of sites per environmental variables to be quickly determined. To increase efficiency, we suggest that the GIS be linked (or at least compatible) with the ARCSITE database, to allow more sophisticated retrieval and manipulation of land use and environmental data. The GIS should contain basic survey information, such as location of the project, acreage inventoried, and number and type of sites documented. We also recommend that the GIS contain detailed plant distributional information, particularly those plants important to Native Americans (both past and present). In this way, areas used (or potentially used) by Native Americans can be quickly elucidated.

5. The final note here is not a recommendation, but instead is a suggestion to the uninitiated dBASE IV database user. The ARCSITE database currently has two memo fields (**Location** and **Fossil**), which allow entry in text form. These fields provide data relating respectively to the site's location and observed cultural materials; they also may appear to be relatively useless fields for manipulating data. However, an obscure dBASE command (which works in dBASE II, III PLUS, and IV) makes it possible to search in a memo field for specific information. The command is " 'word or phrase'$memo field name" (Le Gilsen, personal communication 1990). For example, in Chapter 4, *Environmental Associations*, we counted the number of sites for which shell was listed in

Fossil in this manner: "COUNT FOR 'SHELL'$FOSSIL." This command is a valuable tool for searching for specific place names in **Location**, or for certain types of cultural items in **Fossil**.

OTHER ARCSITE DATABASE RECOMMENDATIONS

1. The BLM currently is developing a data entry program to expedite input into the ARCSITE file. We encourage refinement and implementation of this program as a means of allowing faster and more accurate data entry.

2. A discrepancy exists between the BLM data entry manual (Bureau of Land Management 1989b:4) and the Oregon Natural Heritage Plan (Natural Heritage Advisory Council 1988:18). The manual states that the province classifications used in the Oregon Natural Heritage Plan should be used for entry in **Province**, and also provides a list of provinces to select from. However, the list differs from the classification in the Oregon Natural Heritage Plan, which includes the High Lava Plains and Columbia Basin as a single province, while the list in the manual distinguishes between the two. This discrepancy needs to be eliminated. We believe that the distinction between the Columbia Basin and the High Lava Plains is significant enough that the two should not be incorporated into a single province.

CULTURAL RESOURCE INVENTORIES

The BLM is required by federal legislation and regulations to inventory and protect cultural resources on BLM-administered land (National Historic Preservation Act of 1966, with Amendments [1980]; Executive Order 11593; National Environmental Policy Act of 1969; Historical and Archaeological Data Preservation Act of 1974; American Indian Religious Freedom Act [1978]; Archaeological Resources Protection Act [1979]; 36 CFR 60; 36 CFR 800). When the BLM proposes an undertaking (36 CFR 800.2), the effect of the project on significant cultural resources (i.e., those eligible for the National Register of Historic Places) must be submitted to the SHPO and the Advisory Council on Historic Preservation (ACHP) for review. For these reasons, the BLM conducts "compliance level" cultural resource surveys prior to initiating projects in which cultural resources may be affected. The following is a discussion of recommendations relating to these surveys.

1. As discussed above, and in Chapter 2, *Data Reliability*, one of the problems noted is the lack of standardized site definitions. Along a similar line is our concern for those cultural items which fail to meet arbitrarily established site-definitional criteria. In order to completely understand the articulation of people and the environment, incorporation of all cultural debris across the landscape is necessary, not just the higher concentrations of such debris ("sites") (Dunnell and Dancey 1983; Lebow and Pettigrew 1989a; Lyman et al. 1983; Pettigrew and Lebow 1989), or the location of diagnostic tools. If low-density concentrations are ignored, our perception of human land use is skewed, and certain aspects of land use either ignored or misinterpreted. We recommend that, while the concept of "site" be retained for management purposes, items (including non-diagnostic artifacts) falling below the threshold of the site definition be recorded, mapped, and

incorporated into land-use analysis. The degree of recordation need not necessarily be as high as for sites, but should provide basic locational, environmental, and descriptive data. Two of the authors (Lebow and Pettigrew) have devised and implemented a method by which these items can be quickly recorded in an area where these items are frequent. This method involves counting the number of items observed within a given distance on a given transect, and recording this information on an enlarged USGS guadrangle map (Lebow and Pettigrew 1989a; Pettigrew and Lebow 1989). The information recorded for these "isolates" should be encoded either into the ARCSITE database, or a similar database.

2. If cultural resources are identified within the area of an undertaking, they must be evaluated under the criteria set forth in 36 CFR 60.4. The criterion most frequently used to evaluate prehistoric sites is (d), which includes those sites "that have yielded, or may be likely to yield, information important in prehistory or history" (see discussion below). In order to evaluate a site properly, therefore, interpreting it in the context of local and regional research issues is necessary. Currently, we are able to develop such research issues (see Chapter 6, *Suggestions For Future Research*), but only in a general fashion because the data have been gathered unsystematically. We recommend that the Prineville District conduct large-scale, research-oriented cultural resource surveys, similar to what was done on the Vale District for the Trout Creek-Oregon Canyon Uplands (Pettigrew and Lebow 1989). These surveys should sample discrete physiographic settings, such as the Clarno Basin, or tributary canyons to the John Day and Deschutes rivers, in regions where systematic survey efforts are lacking. Some regions in the Prineville District (such as the upper reaches of the John Day and Deschutes rivers) are woefully lacking survey coverage, and our knowledge of site distributions suffers as a result. A program to systematically test-excavate a sample of sites representative of the various types in different physiographic settings should also be implemented. Specific research issues should be generated by these survey and testing programs, against which other sites, identified in compliance-level surveys, can be evaluated. While such programs may sound like expensive propositions, in the long run they actually are cost-effective because the evaluation process becomes more efficient (cf. Lebow and Pettigrew 1989a). To evaluate the significance of sites in a research vacuum is much more difficult.

3. We also recommend that the BLM enter into a PMOA (Programmatic Memorandum of Agreement) with SHPO, the ACHP, and other interested parties to facilitate the management of artifact scatters. These are by far the most common site type present in the Prineville District, and the current review-and-compliance process for each site is an inefficient and time-consuming impediment to managing these resources. This same problem has been confronted in eastern Oregon by the USDA Forest Service, who entered into a PMOA in order to streamline the process (Keyser et al. 1988). The objectives of that particular PMOA are:

> 1. To ensure that these sites are given treatment commensurate with their archaeological value and the nature and extent of project impacts.
>
> 2. To facilitate the treatment (including avoidance and data recovery) of lithic scatter sites that are in danger of impact from land management activities (e.g., timber harvest, road construction, etc.).

3. To ensure that appropriate information concerning the inventory, evaluation, and treatment of these sites is communicated to the SHPO where it will be available to the archaeological community.

4. To ensure that data recovery (when appropriate) is directed toward current archaeological issues, and results in accumulation of information that advances the knowledge of archaeology in this area of Oregon.

5. To formalize research question to which data from these site might be relevant (Keyser et al. 1988:3).

The BLM should enter into a PMOA with similar goals, but designed to fit BLM needs, to expedite the review-and- compliance process, and to set standards and consider research issues when a proposed project will have an adverse effect on a site. These standards should include systematic surface collection, testing to discover the extent of horizontal and vertical subsurface deposits, and, when necessary, data recovery to mitigate impacts, with prescribed analyses which will maximize the information value.

4. When reviewing the literature, we observed a high degree of variability in the intensity of the survey coverage (measured by distance between transect intervals), ranging from 15 m in the Redmond Training Area survey (Lyman et al. 1983) to 200 m in the Hampton Butte Land Exchange (Anonymous 1982), to the opportunistic survey with no set interval in the Glass Buttes survey (Mack 1975). In order to have data comparable between surveys, the intensity must be consistent. We recommend that the maximum transect interval not exceed 30 m (and 15 m would be better). When the interval is greater than 30 m, many smaller sites fit between transects and thus are not observed (cf. Goheen 1982); this has the effect of skewing our perception of site distributions away from smaller sites and towards relatively large sites. We are thus under-representing a component of the total land use pattern.

PREVIOUSLY RECORDED CULTURAL RESOURCE SITES

One of the major tasks facing the Prineville District is managing the cultural resources known to exist on the District. Some sites on the District might be eligible for special management designations. In the following discussion we present recommendations concerning those cultural resources we perceive as meeting the requirements for special considerations. Cultural resource attrition is a serious problem on the District. Cultural resources are non-renewable, and have been diminishing at an alarming rate. As stewards of the land, the Prineville District has the responsibility and legal obligation to protect the significant cultural resources on BLM-administered properties. Clearly, one of the most critical problems in this regard is vandalism (including theft of artifacts). In this section we recommend steps that may alleviate site looting, and discuss other potential impacts to cultural resources on the District. Subsequently, we present administrative actions the Prineville District might consider to allay land use conflicts.

SPECIAL DESIGNATIONS

Some cultural resources on the Prineville District, because they are particularly valuable for interpretation, scientific, socio-cultural, or other management reasons, are eligible for special designations. If they meet the criteria, cultural resources might be assigned to an Area of Critical Environmental Concern (ACEC), entered on the Historical American Engineering Record (HAER), nominated to the National Register of Historic Places (NRHP), designated a National Historic Landmark, or placed on the World Heritage List. The following discussion presents the criteria for inclusion in each of these special designations, and identifies sites on the Prineville District which may be eligible for these designations. By identifying potentially eligible sites, we are **not** implying that other sites may not be eligible.

AREA OF CRITICAL ENVIRONMENTAL CONCERN

Areas of Critical Environmental Concern (ACEC) were established by the Federal Land Policy and Management Act as

> Places within public lands where special management attention is required to protect and prevent irreparable damage to important historical, cultural, or visual values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards (Bureau of Land Management Manual Section 1613).

Currently, the Oregon Trail sites at Fourmile Canyon and McDonald Crossing, and three sections of the Huntington Wagon Road are listed as ACECs in the Prineville District. In addition, the 16,860-acre Badlands ACEC includes pictographs within the values listed.

We believe, due to loss through extensive and continuing theft (see discussion below), that all the sites on BLM-administered lands along the river and major tributary stream corridors in the lower sub-basins of the John Day and Deschutes rivers should be designated as ACECs. The lava tube cave sites on BLM land (such as Redmond Cave and Pictograph Cave) should be similarily designated, due to their relative rarity and the fact that they are subject to vandalism and looting.

HISTORIC AMERICAN ENGINEERING RECORD

The Historic American Engineering Record (HAER) consists of archival records of important engineering and industrial works, and includes measured drawings, professional photographs, photocopies of old materials, and written historical and technical reports. The Rock Creek Mining District Ditches were placed on HAER (No. OR-9) in August 1989. Three ditches are involved: Upper Ditch, begun in 1865; the Lower Ditch, begun ca. 1870; and the Waterman Ditch, begun in 1895. This District, also called the Antone or Spanish Gulch Mining District, has been formally determined eligible for the National Register (see below). The Deschutes Railroad corridor, containing many features relating to early railroad construction, also should be considered as an HAER district.

NATIONAL REGISTER OF HISTORIC PLACES

To be eligible for inclusion on the National Register of Historic Places, a site must meet the requirements set forth in 36 CFR 60.4. These criteria are intentionally worded so as to allow a wide variety of resources to be considered. The National Register criteria for evaluation are:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
> (b) that are associated with the lives of persons significant in our past; or
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> (d) that have yielded, or may be likely to yield, information important in prehistory or history.

As a general rule, a site must be over 50 years of age to be considered eligible to the National Register.

Each site (or groups of sites with a common theme, forming a district) must be evaluated against these criteria. As mentioned above, prehistoric cultural resources usually are judged in relation to criterion (d); those representing the historic period may qualify under other criteria also. Without visiting and conducting an in-depth evaluation at each site, determining a site's eligiblity would be impossible. Cultural resources should be managed as eligible until proven otherwise.

A single prehistoric site on BLM-administered land in the Prineville District is currently on the National Register of Historic Places. The Macks Canyon Site (35SH23 -- National Register Number 75001600) is an open site located on the east side of the Deschutes River, at Macks Canyon Recreation Park. The site was excavated by the University of Oregon from 1965 through 1968, revealing prehistoric house features and abundant lithic and faunal remains (Cole 1967, 1969). The site is presently contained within a wire fence to discourage vandalism and looting.

Other sites have been considered for nomination to the National Register. After his survey of the John Day River corridor, Michael Polk (1976) completed National Register nomination forms for two archaeological districts (the forms on file in the Prineville District office apparently were never submitted to SHPO for comment), both within the John Day Canyon. One of these districts is just south of Thirtymile Creek, and consists of 13 prehistoric sites (10 open sites, 1 shelters/cave site, 1 artifact scatter, and 1 rock feature site) in close proximity to each other. The second district consists of 12 prehistoric sites in The Gooseneck-Ferry Canyon vicinity, including seven open sites, three shelters/cave sites, and two artifact scatters. In addition, this district has an historic component, with three historic sites (a ferry crossing and two abandoned homesteads). In a similar fashion, National Register nominations were completed for the complexes of sites identified during the survey of the Deschutes River corridor (Hibbs et al. 1976). Other sites considered for nomination (or at least considered eligible) by the BLM include Pictograph Cave (35DS67), the Sinamox Pictographs Site, the Nena Rockshelters, the Sage Hollow Juniper Hut, an 1869-inscribed juniper tree, and sites OR-05-221, 224, 230, and 245 (list on file in the Prineville District office).

No historic sites in the Prineville District are currently listed on the National Register of Historic Places. Two cultural resources, Spanish Gulch (as a mining district) and the Fourmile Canyon Segment of the Oregon Trail, have been formally evaluated and found eligible for inclusion on this list (Suzanne Crowley Thomas, personal communication 1990). The Spanish Gulch District has been extensively documented by Willingham (1982). In addition, nomination forms have been completed for various historic resources. A second section of the Oregon Trail, the McDonald Crossing of the John Day River, is included among these. A National Register nomination for the Willamette Valley and Cascade Mountain Military Road was begun in 1973, but never completed. A nomination form for a 12-mile segment of the Meek Cutoff (northeast of Bend) was completed, and includes blazes and a possible grave (for this segment of the cutoff, there seems to be no site number). Sherar's Bridge and Falls was similarly documented, but is quite perfunctory, making no mention, for example, of the crossing before the l860s (see Conyers [1906], for example, on the Olney Ferry). The Bend-Prineville Wagon Road was assessed in relation to National Register criteria, and found ineligible (Follansbee and Frances 1980a), although Lyman et al. (1983:98) question this determination, and suggest that this resource be included with other wagon roads in a district nomination. National Register background documentation of the Oregon Trunk Railroad Stationmasters Quarters in Maupin was prepared for the BLM by Stephen Dow Beckham in 1988. The house is incorrectly said to have no style, whereas it is a classic example of a bungalow, almost as close to the originals in Bengal as it is possible to be with local building materials (forms on file in the Prineville District). No site forms exist for a number of the cultural resources listed here (the Oregon Trail's Fourmile Canyon Segment and McDonald Crossing, the Willamette Valley and Cascade Mountain Military Road, the Meek Cutoff, Sherar's Bridge and Falls, and the Stationmasters Quarters in Maupin), even though they have been documented by other means. We recommend that the District complete site forms for these particular sites.

The properties listed above represent those sites on, or given serious consideration for, the National Register on BLM-administered land in the Prineville District. This far from exhausts the list of sites potentially eligible for inclusion on the National Register; under criterion (d), a large proportion of the cultural resources identified on the Prineville District are potentially eligible, while others (particularly historic sites) may also qualify under other criteria. However, each site (or district) needs to be evaluated on its own merits; to determine a priori what cultural resources are eligible to the National Register is not possible. Specific sites (or groups of sites) on the District are of particular interest, and warrant mention. We recommend that these sites or districts (discussed below) be evaluated in relation to the criteria for eligibility to the National Register; information currently available is insufficient for determinations of eligibility. We also suggest that the District nominate to the National Register a representative sample (those that can serve as "showcases") of those sites deemed eligible. While little direct benefit accrues to the BLM for having sites on the National Register, such sites can serve as centerpieces in public interpretive displays, presentations, and literature, and demonstrate the BLM's interest in, and commitment to, managing cultural resources. The cost of placing sites on the National Register prohibits wholesale nominations, and therefore we recommend such consideration only for those sites which would showcase the District's cultural resource management efforts.

Three major classes of historic sites need National Register attention: (1) overland emigration trails and features; (2) mining districts, camps, and engineering features; and (3) homestead building complexes. Overland trails and features already are attended to fairly well; a fine beginning has been made with the studies and HAER nomination of the Spanish Gulch (Rock Creek/Antone) District (cf. Willingham 1982); but homesteads have not been seriously approached. A dozen or so homesteads perhaps ought to be nominated, as they represent the very core of our history in north-central Oregon. Collectively they can contribute much toward an understanding of not only local history but that of the nation as a whole. Nominating homesteads individually to the National Register may seem too much trouble; scattered properties together can be combined under one nomination (as a district), especially if they represent a single theme, time period or community, albeit discontinuous. Therefore we should think about nominating the group of interesting homestead and related sites southwest of Mitchell, or the group that just came to light on Sutton Mountain, or a group near Paulina, or near Millican. We prefer to approach these sites as groups, for they very often represent dispersed communities, a type of settlement insufficiently discussed thus far in our social history. Such communities of homesteaders were linked together by a school, sometimes a church, a post-office, a store, and by communal activities. Such dispersed communities sometimes represented a particular religious sect, a particular ethnic affiliation, a particular home in the Midwest, and so forth. Many of the people frequently took their lands under the same law. For example, many sites near Mitchell were entered under the Timber Culture Act. This sometimes is seen as simply a vehicle of fraud, but we may have here evidence to the contrary. Alternatively, we may be oversimplifying the interpretation of what happened.

The following historic sites of particular interest were gleaned from the Prineville District site records: (1) the log schoolhouse of the l890s on Big Summit Prairie (OR-05-564); (2) a ruined still with a large assemblage, dating from ca. 1925, near La Pine (OR-050-742); (3) the townsite of Barite (ca. 1902-06) in the Rock Creek (Antone or Spanish Gulch) Mining District (OR-05-42); (4) The Dalles-Canyon City Road (OR-05-384 -- this site has already been suggested by BLM staff); (5) the putative Meek Train Grave (OR-05-478); (6) possible Meek route blazes (OR-05-619); (7) two homestead sites near Mitchell (OR-05-760 and 761). In addition, four historic sites have been identified which, with further research, may prove to be particularly significant. Site EA1 (the Elder Creek Site) consists of two sets of stone foundations on the Deschutes River. This site is alleged to be connected to railroad construction, but this is unproven. A stone "guardhouse" (EAl6) on the Deschutes River is alleged, on the basis of nearby trash deposit, to be connected to railroad construction. However, this needs to be confirmed by careful work on the structure itself; it could be just as readily associated with another historic episode. (It would be beneficial to conduct an evaluation study of all sites associated with, or alleged to be associated with, railroad construction along the Deschutes River.) Site JD 79 includes homestead foundations along the John Day River, and Site OR-05-788 includes foundations overlooking Bridge Creek. These could date as early as the l860s. BLM holdings at Canyon City could be included in a National Register district for the town and relevant surroundings. This probably will have to be a cooperative venture. The Dixie Mining District should be explored for nomination as a National Register district. Its national significance is unquestioned, but the degree to which its features and sites have survived dredging and related activities is uncertain.

Prehistoric sites associated with Glass Buttes, when considered as a district, contain a wealth of information (particularly relating to resource extraction, lithic reduction, and trade patterns), and are certainly potentially eligible to the National Register. The complexes of sites along the lower John Day River (such as those suggested by Polk [1976]) could well be eligible, and might best be considered as a district or districts; the same can be said for the sites recorded by Hibbs et al. (1976) along the lower Deschutes River. The open sites OR-05-560 and 562 (both apparently with housepits) located in Big Summit Prairie are very intriguing, and could represent an aspect of aboriginal land use (upland extended habitation sites) not previously documented ethnographically or archaeologically. The lava tube caves on BLM land (such as Redmond Cave and Pictograph Cave) are significant because of their relative infrequency, and because these sites are extremely subject to vandalism and looting. Sites on the District with juniper structures (35CR16, OR-05-507 and 621) are significant because they are rare, and offer unique opportunities to directly examine aboriginal structures.

It must be understood that the above are sites we found particularly intriguing: **it is by no means an exhaustive list of those sites considered eligible to the National Register**. To reiterate, sites or districts require in-depth evaluation to determine eligibility, far beyond the information available at this time.

NATIONAL HISTORIC LANDMARK

The National Park Service is responsible for administering the National Historic Landmarks Program, whose purpose is to recognize and preserve nationally significant properties. The criteria against which a property is evaluated are listed in 36CFR65.4 as:

> The quality of national significance is ascribed to districts, sites, buildings, structures and objects that possess exceptional value or quality in illustrating or interpreting the heritage of the United States in history, architecture, archeology, engineering and culture and that possesses a high degree of integrity of location, design, setting, materials, workmanship, feeling and association, and:
>
> (1) That are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history and from which an understanding and appreciation of those patterns may be gained: or
>
> (2) That are associated importantly with the lives of persons nationally significant in the history of the United States; or
>
> (3) That represent some great idea or ideal of the American people; or
>
> (4) That embody the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style, or method of construction, or that represent a significant, distinctive and exceptional entity whose components may lack individual distinction; or

> (5) That are composed of integral parts of the environment not sufficiently significant by reason of historical association or artistic merit to warrant individual recognition but collectively compose an entity of exceptional historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture; or
>
> (6) That have yielded or may be likely to yield information of major scientific importance by revealing new cultures, or by shedding light upon periods of occupation over large areas of the United States. Such sites are those which have yielded, or which may reasonably be expected to yield, data affecting theories, concepts and ideas to a major degree.

Like those eligible to the National Register, National Historical Landmark properties generally are required to be more than 50 years old. A site need not be on the National Register to be included as a National Historic Landmark site, although such is often the case. A property designated a National Historic Landmark is automatically entered on the National Register. Landmark sites are identified primarily through theme studies, which "provide a contextual framework to evaluate the relative significance of historic properties and determine which properties meet National Historic Landmark criteria" (36CFR65.5).

With information currently available we cannot discern the National Historic Landmark eligibility of the Prineville District's cultural resources. As with National Register eligibility determinations, each site (or group of sites) must be evaluated on its own merits, against the criteria listed above; such evaluations require substantially more data than is provided on site forms derived from surface observations. Due to the high cost of placing a site on the National Historic Landmark list, and the paucity of benefits to the District from such an action, we do not recommend that the District pursue this line of site management.

The three sites on the District that were formally evaluated as eligible, or are on the National Register, are exceptions to this lack of data. The Macks Canyon Site (35SH23) is on the National Register because it has yielded, and has the potential to further yield, information important to our understanding of prehistory (36CFR60.4[d]). However, the National Historic Landmark criterion most applicable to the Macks Canyon Site, 36CFR65.4(6), is more restrictive, requiring that the site yield data pertinent to large areas of the United States, which "affect theories, concepts and ideas to a major degree." As reported by Cole (1967, 1969), the information from the Macks Canyon Site does not meet this criteria, suggesting that the site is ineligible for National Historic Landmark status. However, reanalysis of the existing data or further excavations might reveal information meeting this National Landmark criterion, so without further evaluation we cannot categorically state that the Macks Canyon site is not a National Historic Landmark property. The Spanish Gulch mining district, determined eligible for the National Register, does not appear to be significant at the national level, and thus probably is not eligible as a National Historic Landmark. The Fourmile Canyon segment of the Oregon Trail, also formally determined eligible for the National Register, is likewise probably not a candidate for National Historic Landmark status. The national significance of the Oregon Trail is beyond dispute, but many segments of the Oregon Trail exist, and the Fourmile Canyon segment is not an exceptional example.

WORLD HERITAGE LIST

The international Convention concerning Protection of the World Cultural and Natural Heritage, promulgated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and ratified by the United States in 1982, has established the World Heritage list as a means of recognizing and protecting cultural and natural properties of outstanding universal value to mankind. The Department of Interior (National Park Service) is charged with the responsibility of directing and coordinating efforts on behalf of the World Heritage Convention in the United States (Federal Register, Vol. 49, No. 113). The criteria for including a cultural property on the World Heritage List is as follows (Federal Register, Vol. 47, No. 5):

> A monument, group of buildings, or site which is nominated for inclusion on the World Heritage List will be considered to be of outstanding universal value for the purposes of the Convention when the Committee finds that it meets one or more of the following criteria *and* the test of authenticity. Each property nominated should therefore:
>
> (a)(i) Represent a unique artistic achievement, a masterpiece of the creative genius; or
>
> (ii) Have exerted great influence, over a span of time or within a culture area of the world, on developments in architecture, monumental arts or townplanning and landscaping; or
>
> (iii) Bear a unique or at least exceptional testimony to a civilization which has disappeared; or
>
> (iv) Be an outstanding example of a type of structure which illustrates a significant stage in history; or
>
> (v) Be an outstanding example of a traditional human settlement which is representative of a culture and which has become vulnerable under the impact of irreversible change; or
>
> (vi) Be directly and tangibly associated with events or with ideas or beliefs of outstanding universal value; and
>
> (b) Meet the test of authenticity in design, materials, workmanship or setting.
>
> The following additional factors will be kept in mind by the Committee in deciding on the eligibility of a cultural property for inclusion on the List: (a) The state of preservation of the property should be evaluated relatively, that is, it should be compared with other property of the same type dating from the same period; and (b) Nominations of immovable property which is likely to become movable will not be considered.

As with the other special designations, each site in the Prineville District must be evaluated on its own merits to determine eligibility for the World Heritage List, and the information currently available is insufficient to make such determinations. Given the emphasis in the criteria on "outstanding universal value," and considering the types of cultural properties currently on the List (such as Chaco Culture National Historical Park), we consider it unlikely that any cultural resources on the Prineville District could be placed on the World Heritage List.

SITE-SPECIFIC RECOMMENDATIONS

The Prineville District has expressed particular interest in certain sites (Crowley Thomas, personal communication 1989); some of these sites were visited during IRI's reconnaissances of the District. The following are specific recommendations derived while visiting these sites.

As previously mentioned, the Macks Canyon Site (35SH23) is the District's sole entry on the National Register, and was partially excavated by the University of Oregon (Cole 1967, 1969). During our reconnaissance of the site, we noticed that the site is more extensive than indicated by Cole. We therefore recommend that the site vicinity be documented intensively through survey and subsurface testing to determine the extent of cultural deposits. In addition, the analyses and subsequent reports produced by the University of Oregon suffer from brevity. We suggest that the site be reanalyzed using current techniques and standards, and a report produced documenting the site in the context of present archaeological research issues. The resultant information should significantly increase our ability to generate and address research questions on the District, and thus would directly benefit the evaluation process for other sites.

The Glass Buttes area has served for millennia as a source of obsidian, and continues to serve this purpose today. We recommend that this area be surveyed more intensively than the "opportunistic" survey conducted by the University of Oregon (Mack 1975), and that the sites be evaluated as a district for inclusion on the National Register of Historic Places. Easy access to Glass Buttes both aids and complicates management. The accessibility means that this locality has good potential for a public interpretation center (see discussion in Chapter 5, *Resource Use Categories*), and we recommend that the feasibility of such a center be examined. Easy access is also a problem, however. Too much obsidian may be collected, depleting what is a large, but finite, resource. Contemporary obsidian knapping is also a concern: without hydration rind measurements, it may be impossible to distinguish between sites created today and those representing the prehistoric period. From a research perspective, comparison of contemporary and prehistoric "sites" may prove informative, but certainly causes management problems, for the contemporary "sites" obviously are ineligible for the National Register, and thus may be managed differently than sites potentially eligible. To alleviate these problems, we suggest that access be limited by erecting locked gates at the access roads. Contemporary obsidian quarrying and knapping is a legitimate use of Glass Buttes, and is consistent with past usage, so we recommend that a system be devised by which limited collection could continue. A permit system (with permits obtained at the Prineville District office), for limited quantities allowed from a specific area (or areas), may be the best approach. Prior to implementation of this system, the existing cultural resources in the specified area(s) should be intensively documented. Knapping would be allowed within this area, thus providing a means by which future investigators could compare past and present obsidian reduction techniques; at the same time, management of the Glass Buttes area would be simplified.

When visiting Pictograph Cave, we noticed that, although the site record describes only rock art, the site does contain a lithic component. Soil deposition is possible both within the cave and at the mouth; we recommend that these deposits be tested to determine the extent of the lithic component and, as the site has been looted, to ascertain the extent of the damage. We also observed that the site record does not include all the pictographs, so we suggest that the site form (and subsequently the database) be updated to include all the rock art, as well as the lithic component.

We visited two locations of the Oregon Trail (the Fourmile Canyon segment and the McDonald Crossing of the John Day River). The Fourmile Canyon segment is currently an interpretive site, and an engraved stone marks the location of the McDonald Crossing. The interpretation of both areas could certainly be upgraded, (the usefulness of interpretive sites is discussed below) and both of these locations have excellent potential for interpretation. The interpretation should be much more detailed than at present, and site forms for both locations should be prepared. We suggest also that the Prineville District inventory all the potential Oregon Trail locations on BLM-administered lands to identify remains such as tracks, historic sites, and wagons.

Two possible open sites (OR-05-560 and 562) have been recorded on Big Summit Prairie, and were visited during our reconnaissance. These sites are characterized by a scatter of lithic debitage, and circular depressions that might be prehistoric house features. The sites are in excellent condition. The presence of open sites (with housepits) in an upland setting such as Big Summit Prairie, well away from riverine resources, is at odds with the ethnographic and archaeological data (although Minor et al. 1987 also indicate that a site with circular depressions was observed on private land north of Big Summit Prairie). We recommend that sites OR-05-560 and 562 be discreetly test-excavated to determine if the circular depressions are in fact prehistoric house features. Discreetness is necessary for the risk of looting could increase considerably. The data potential in these sites is very significant, and the BLM should make every effort to ensure that they are not disturbed. If one or both of these sites do contain house features, implementation of protection measures is imperative. Because access onto the prairie is already limited to a few roads, restricting access by erecting locked gates at the entrances to the prairie may be feasible. Big Summit Prairie is largely in private ownership, so the aid of the landowners in monitoring illegal activities may be possible.

PROTECTION OF CULTURAL RESOURCES

Managing cultural resources includes protecting these resources from destructive forces. Vandalism (such as looting and casual collection) is a major problem in the Prineville District, particularly for certain site types (open sites, shelters/cave sites, artifact scatters with subsurface components, rock art sites, and certain rock feature sites). As noted by Polk (1976:52) after his survey of the John Day River corridor, vandals "have disturbed virtually every rockshelter site known in the Canyon." Even though relatively severe penalties are mandated for destruction of archaeological sites (Archaeological Resource Protection Act of

1979), looting continues at an alarming rate. In order for the law to work as a deterrent the culprits must first be caught and prosecuted. We therefore make the following recommendations.

1. The Prineville District should implement a program for aerial patrolling those areas experiencing the most vandalism. The primary focus should be to monitor those areas with a high frequency of open sites (those with housepits) and shelters/caves, both of which are favorite targets for vandals. As discussed in Chapter 4, *Environmental Associations*, these site types are concentrated in the lower sub-basins of both the Deschutes and John Day rivers. We therefore suggest periodic aerial patrols (two or three days apart) in each sub-basin, for the purpose of discouraging looting and apprehending vandals. It may also be useful to enlist the help of local ranchers, who often are aware of the vehicular traffic into the river corridors, and can contact law enforcement officers when suspicious activities are observed.

2. When vandals are apprehended, the BLM must prosecute to the fullest extent of the law. If the individuals are not prosecuted, then the law becomes useless, and fails as a deterrent.

3. The Prineville District currently has an informal monitoring policy in the John Day river corridor (Suzanne Crowley Thomas, personal communication 1990). The purpose of the policy, which originally also included the Deschutes River corridor, is annual documentation of the extent of vandalism at specific sites (other sites are similarly visited every three or four years). We recommend that this policy continue, and expand to reincorporate sites along the Deschutes River. Other sites which should be visited annually to document vandalism include the lava tube sites (such as the Pictograph and Redmond Cave sites), the sites with possible house features on Big Summit Prairie (discussed above), and the sites with house features in the Muddy Creek drainage (such as 35WS210 and 35JE223). Only through such documentation can we determine the extent of the vandalism problem.

4. We also recommend, as a preemptive measure, that a representative sample of the site types most subject to looting (open sites and shelters/caves) be excavated, as part of a vigorous and well designed data recovery program, in order to learn as much as possible about them while they still exist. The excavations must be on a scale large enough to provide useful data for addressing current research issues, as well as questions which might arise in the future. These excavations should be carried out with the highest professional standards; it cannot be emphasized enough that once a site is disturbed by excavation (whether by professionals or vandals), that portion of the site is gone forever.

5. An innovative vandalism deterrent recently implemented by the BLM consisted of "rehabilitating" a vandalized open site in the John Day River Canyon (Lebow and Pettigrew 1989b). The rehabilitation entailed mapping and photographing the disturbed areas in detail, filling in the vandal holes, recontouring the ground to give the appearance of the original housepits, and remapping and photographing the site. One purpose of the project was to inhibit looting by restoring the landscape to a natural appearance (thus not calling attention to the site). It will be some time before the rehabilitation can be proven as a deterrent; Lebow and Pettigrew (1989b:23) point out that the process might actually encourage vandalism by creating the appearance of an attractive, pristine site, and by uncovering parts of the site previously protected under the vandal backdirt piles.

Conversely, rehabilitation might discourage looting in several ways: removal of the backdirt piles and filling in the holes makes the site less obvious to people passing by; potential vandals might be discouraged by not knowing what areas have previously been looted (if they dig in previously looted areas, they will not be rewarded for their efforts); and the apparent pristine condition of the site might discourage those who tend to dig only where others have done so previously. One benefit of rehabilitation is clear: we will now know when the site is vandalized again.

Lebow and Pettigrew (1989b:24) note that "the stakes are high enough and the issue important enough that a greater effort should be made to determine the effectiveness of rehabilitation," and suggest a systematic program to explore its usefulness. The recommended program consists of rehabilitating additional (five or ten) vandalized sites, and similarly documenting, but not rehabilitating, the same number of vandalized and unvandalized sites (to serve as a control group). A program of monitoring and evaluation of the degree of vandalism at both sets of sites should then be implemented, and, with the passage of sufficient time, assessment of the value of rehabilitation. We recommend here that this program be undertaken.

6. The above measures to deter vandalism might be considered short-term approaches. Other measures involving public awareness and education might prove to be more beneficial in the long term. People have an inherent interest in the past, and we can turn this interest to an advantage for the management effort. We therefore recommend implementation of specific programs aimed at enlightening the public regarding cultural resources and cultural resource management.

One of the most frequent complaints voiced by both casual collectors and the more-ardent looters is that archaeologists keep the artifacts and knowledge to themselves. To attempt to alleviate this perceived inequity, we propose that the BLM establish interpretive sites at various locations. Artifacts, photographs, and interpretive text explaining the meaning of the various items would create interest in the past, and foster an awareness of the importance of cultural resources. These interpretive sites would serve not only to educate the public about the history and prehistory of the area, but could also explain that cultural resources represent our heritage, and need to be protected. The foyers of the BLM state, district, and resource area offices, where the public already obtains maps, permits, and other information, would be an ideal place for small interpretive displays. Brochures explaining the history and prehistory of the area could be located next to the displays. Other, larger and more-detailed, interpretive sites could be located at specific sites, such as in the Glass Buttes area (see discussion in Chapter 5, *Resource Use Categories*).

Another means of disseminating information to the public is through the media and direct contact. Periodic releases to the newspapers describing interesting discoveries or research results (and simultaneously discussing the importance of preserving sites) would be beneficial. Public presentations are another means by which cultural resource information can be widely disseminated. As younger children are quite impressionable, visits to schools may be useful, during which visual aids (artifacts and photographs) can be used to foster interest in preservation of cultural resources. The District should consider having staff archaeologists, or recruits from the professional community, give general-interest presentations to civic groups at the various municipalities within the District. Books, or perhaps a series of pamphlets, directed at the public, describing interesting aspects of the past, and at the same time stressing the importance of preserving cultural resources, would be beneficial. Such literature could be provided free of charge (or for a minimum fee) at the District offices, bookstores, curio shops, motels, and restaurants. Television coverage of excavations (such as those proposed above) would stimulate interest in cultural resources. Public tours might be possible at an excavation in a relatively accessible area. Through these means, the public perception that the BLM (and cultural resource specialists in general) is selfishly hiding something might be alleviated. Given enough public interest in preserving our heritage, the problems of vandalism will significantly decrease.

Vandalism is not the only destructive force at work on cultural resources in the Prineville District, as natural forces (cf. Wood and Johnson 1978) can also disturb or destroy sites. The major problem noted on site forms in this regard is erosion, and special problem areas are those sites adjacent to the John Day and Deschutes rivers. A number of the site records in the District (particularly for midden and open sites) note that portions of the sites have eroded away. We recommend (1) that those sites eroding, or likely to erode, be identified and evaluated, and, (2) that stabilization measures be implemented to deter the problems at those sites considered significant. These stabilization techniques will vary depending upon the specific situation at the site, but might include simple rip-rap to protect the river bank in the site area. Other natural processes potentially affecting cultural resources can be categorized under the broad headings of faunalturbation, floralturbation, graviturbation, and aeroturbation (Wood and Johnson 1978). These forces are noted only rarely during site recordation, and the ARCSITE database currently does not provide entry of disturbance processes, so without further information it is impossible to determine the extent of disturbance from these processes, or to recommend stabilization measures.

ADMINISTRATIVE LAND USE ACTIONS

Other processes potentially destructive to the District's cultural resources are in the form of BLM land-use activities, such as grazing allotments, fencing, water development, firewood harvesting, logging, mining, road construction, recreation facility development, and land exchanges (through relinquishment of cultural resource management duties). In order to avoid impacts to cultural resources by these activities, cultural resources should play an integral role in the land use planning process. The purpose of compliance-level cultural resource surveys is to inventory sites prior to disturbance by such activities, and we certainly recommend that these surveys continue; if sites are recorded and the activity proceeds, the sites **must** be evaluated and effects determined. Through adherence to this established process, land use conflicts can be either avoided or mitigated.

In addition to the review-and-compliance process, the Prineville District has at its disposal various administrative actions which can be used to resolve land-use conflicts, including but not limited to: withdrawal of grazing allotments, mineral withdrawal, land exchanges, and access restrictions. The applicability of any particular administrative action is dependent upon the effect the proposed land use will have on the cultural resource in question, and upon the feasibility of the action. Both of these issues must be addressed on a site-specific basis by BLM personnel or their representatives, and weighed against the option of mitigating the effect through data recovery.

ADDITIONAL DATA NEEDS

This section is a discussion of aspects of cultural resource management in which we believe more data are necessary to develop a more complete program and to improve management efficiency. These include miscellaneous recommendations not within the categories discussed above.

1. We suggest increased cooperation and coordination of the BLM with local Native American tribal organizations and their representatives. Especially in north-central Oregon, the land is much more than just a repository of abandoned sites and no-longer-used artifacts; it is a living environment in which local Native Americans not only retain guaranteed rights, but maintain ongoing culturally significant relationships which must be recognized and respected. Land managers should be as aware of present use areas (e.g., gathering, fishing, and religious use) as they have been of archaeological sites.

2. Awareness and utilization of local Native Americans' own fund of knowledge about the land and its resources should be increased. Such "ethnoscientific" knowledge has been collected by both local tribal organizations and a few active anthropological researchers (see discussion in Chapter 6, *Suggestions For Future Research*), and should be consulted and utilized in land management decisions.

3. The above topic leads to more specific recommendations. Local Native Americans made use of several plant species which have potential economic value beyond their own cultures (Hunn and French 1981; Turner 1981). Such species should be identified, monitored, and singled out for protective measures, if necessary. We also suggest that the BLM make a specific attempt to preserve environments where native resources were concentrated (such as the sam and tay mentioned in Chapter 3). In some cases Native Americans practiced management and mitigation techniques of their own (e.g., fire in huckleberry fields: see French 1957) which are of potential use today. As a general rule, we suggest that, wherever Native American utilization of the land was (or is) unique, culturally specific, and different from the Euro-American pattern, preservation and protection measures of pertinent landscapes should be considered. Such diversity, both ecological and cultural, is valuable and should not be lost.

4. The data currently supplied on forms by the field archaeologists are quite good for the historic sites. The Prineville District historic site forms are among the best we have seen. One common shortcoming, though, is a lack of discussion of associations with other sites or districts. Reseachers and managers need to know if the surveying archaeologist has seen a similar site before, or if the recorded site seems to be something new. Is the configuration of the buildings something that belongs to a recurring pattern? Is the root cellar in a typical or an atypical place? Are the trash deposits unusually far or close to the dwellings? The careful studies of time-sensitive criteria are often interesting, though once again they are of an atomistic character in that they make very little reference to other sites. Such information could be entered in the "comments" section of the site forms. The sketch maps usually are good, but they illustrate by implication that one of the major documentation needs is to make scale maps of many of these sites, and not just of homesteads, but overland trail sites, and mining and irrigation engineering sites as well. This is a very important way to preserve much of this information from inevitable destruction at some time in the future. These maps need to be made with a transit, or

with a good cruising compass. The advantage of the approach with cruising compass is that it takes just one person, while the transit requires two. Not only should the correct spatial relationships of features be recorded, but also a correct idea of the immediate environment--large trees, water, gulches, cliffs, outcrops, slopes, etc.

5. There is a slight paradox in the meticulous recording of historic artifacts in the field, matched to the reluctance to collect any of them. If they are just to be left to the mercies of the relic collectors, perhaps we are not using our time in the best way. Collecting the more interesting items for exhibit might be better.

6. Another place for significant improvement is photography of features. For sites with standing buildings, ruined buildings, or engineering features, we need not just color slides, but also, routinely, black and white photographs in larger format than 35 mm. This is a key way in which we can preserve this heritage for the future. Every significant site should be the subject of a small photo essay done thoughtfully with an eye to artistry, for the data will survive, and be better conveyed to the viewer, if the photographer tries to catch the mood, indeed the meaning of the scene. Such work should be done either during recordation, or during a latter phase, such as evaluation or HABS/HAER documentation. With a larger negative we can have good enlargements for booklets, for display in the District or State offices, for exhibits at local historical societies and schools, and so forth. The public will show itself grateful for this kind of effort. One can see that this principle is recognized in the fine attempt to record photographically some of the Rock Creek Mining District.

7. In the tour of museums and historical societies made through north-central Oregon by Pettigrew and Chance, three fundamental types of information commonly were found preserved in these institutions. They nearly all had an abundance of artifacts of the past, mostly historic ones. They are mostly the same ones in each museum, but a careful examination could cull out unique items that might be photographed, especially if there was some identification available, or if the archaeologist could say something about the item. A few of these items, carefully studied or recorded, might be helpful in forming a digest of diagnostic artifacts.

The second major type of collection consisted of vertical files or scrapbooks. The vertical files tend to be recent, that is, they have been mostly assembled in the last two decades. In most cases, about five to ten percent of these vertical files consist of primary information of use to professional historians. Much of the rest consists of copies of material available elsewhere, strictly genealogical data, or secondary material that has to be used with considerable caution or effort. The vertical files of the Deschutes Historical Society, the Crook County Historical Society, and the Oliver Museum in Canyon City are of more than average interest, and days would be needed to evaluate each of those filing systems. A quick random sampling revealed valuable material in each case. Each of these three repositories has an indexing system of some help. These institutions all represent the labors of love on the part of just a few individuals in each county, and none of them is supported with adequate money. The biggest problem with this deficiency in public support is that the repositories are not adequately protected from fire or theft. The Oliver Museum is susceptible to flooding as well, from Canyon Creek.

The scrapbooks tend to be older than the vertical files, and they contain clippings of old newspapers. Often the clips do not have dates or the names of the newspapers, but they still are interesting to historians, and important items can be properly attributed with effort. At the Ft. Dalles museum are about a hundred scrapbooks that run from about 1905 through the 1930s. The virtue of some of these scrapbooks is that they contain clips from newspapers that have perished completely, ones that are not on the microfilm files of the Oregon Historical Society. A proper assessment of the scrapbooks would take days in each repository. The BLM should make arrangements to photocopy some of their contents onto acid-free paper. Modern historians do not make sufficient use of scrapbooks, partly because of the work involved. Looking back in time, however, we note that much of the great H. H. Bancroft corpus was based on scraps, some of which one of our authors (Chance) has used himself in the Bancroft Collection at Berkeley.

By far the most valuable collections in the county museums and societies of north-central Oregon are their approximately 8,000 photographs. In no case are they properly curated by the standards of modern, chemically-buffered, photo curation, but all the societies know the value of their pictures, even if there is little they can do to protect them. This is where the state or the federal government must intervene, not by taking the pictures away from the societies, but by duplicating them. They should be copied selectively using large-negative formats, preferably 4 x 5 inch or larger, and enlargements made from the negatives. Original negatives hardly exist at all.

This is a matter in which the BLM could make a very large impact in cultural resources conservation with a comparatively small amount of money allocated each year for the purpose, for a few years. An historian could be detailed to select about 100 pictures each year in each repository. Travelling with the historian, or following behind, would be a professional photographer with a flat-copywork setup, to do the photography on the spot, in the museums, to avoid all the problems and insecurities involved with moving the photographs to other locations. The new photos, selected with an eye to the BLM's interests and obligations, especially historic site interpretation, would be curated by the BLM, or donated to the Oregon Historical Society. They would need proper cataloguing. The public and academic community would view this activity favorably, and it would help to ensure the survival of a priceless cultural resource.

8. The tour by Pettigrew and Chance through the Prineville District also revealed a wealth of information in the form of individuals knowledgable about history and prehistory. Unfortunately, the passage of time decreases the availability of these potential data sources. We therefore recommend that the District implement a program to interview these individuals (listed in Table 7.1), and document the resultant oral histories.

9. The combined cultural resource programs of the BLM and USDA Forest Service have created immense archaeological databases. These databases, however, are currently mutually incompatible, and the data potential untapped. If the databases were to be compatibly automated, with similar file structures, the benefits would be enormous to both land use managers and the professional archaeological community. Distributional analyses, such as conducted in this overview, could be conducted on a much larger scale, incorporating a broader range of environmental variables, and the results would more accurately reflect the articulation of culture and environment. This in turn would increase the efficiency of cultural resource management (as discussed in Chapter 4, *Environmental Associations*). We therefore recommend that the BLM initiate a coordinated program with the USDA Forest Service, in conjunction with SHPO, to standardize and automate site and survey databases.

Table 7.1. Individuals Knowledgeable about History and Prehistory in the Prineville District.

NAME	LOCATION	EXPERTISE
Bob Boynton	Moro	Cottonwood Bridge history and prehistory
Art Campbell	Gold Hill	John Day River History
Keith Clark	Bend	Central Oregon history
Richard Helms	Prineville (?)	Native American use of Big Summit Prairie
Perry Herford	Bend	Deschutes Co. historic sites
Earl, Jerry Herford	Prineville (?)	Native American use of Big Summit Prairie
Bessie Huck	Parkdale	Native Americans in Prineville District
Royal Jackson	OSU, Corvallis	Cant Ranch, John Day Fossil Beds history
Joseph Jones	Camp Hancock	Clarno Basin prehistoric sites
Red Justice	Fox Valley	Long Creek Ranger District, Malheur NF
Oscar Lange	Madras	Sites along Deschutes River
Virgil Langtry	Maupin	Deschutes River history
Carolyn Micnheimer	John Day	Chinese history
Edith Newell	Prineville	Grasslands overview for Forest Service
Larry Neilsen	Redmond	Central Oregon pre-1900 wagon roads
Gale Ontko	Prineville	Native Americans in Prineville area
Shirley Quant	Prineville	Native American use of Big Summit Prairie
Bill Rhoades	Madras	Hay Creek Ranch history
Dick Rice	Yakima, WA	Sites along Deschutes River
Ken, Barbara Robinson	Bend	Deschutes Co. prehistoric sites
Barbara Sharp	Grass Valley	Sherman Co. history
Kathy Startz	Condon	Gilliam Co. history
Jack Steiwer	Fossil	History, prehistory of John Day Canyon
Dell Wells	Bear Valley	History
Clifford, Irene Williams	Powell Butte	Prehistoric site (cave) in Christmas Valley

10. We recommend that the Prineville District develop a predictive model (or models) relating to their cultural resources. Such models are valuable tools (Darsie and Keyser 1985; Kincaid 1988) for land-use planners, and can increase the efficiency of the District's cultural resource management program. The site-distribution data presented in the Chapter 4, *Environmental Associations*, is a significant step towards building such a model, as is the discussion of Native American land-use patterns in Chapter 3.

11. Geomorphological data specific to the Prineville District would be a significant contribution to the District's cultural resource management program. Such data would help address, as well as generate, many research questions, particularly those relating to cultural adaptations. Our current concepts of human land use are biased towards those sites visible on the existing ground surface. However, as discussed in chapters 3 and 4, land use may have varied with changes in the environment; evidence of such use may be buried beneath the surface (such as within an alluvial terrace), and missed during a cultural resource survey. A construction activity (such as a spring development) at such a place may expose a buried site, creating construction delays or destroying the site. Geomorphological data, when used in conjunction with a predictive model such as proposed above, could aid cultural resource management by suggesting those locations where buried sites may exist. We therefore recommend that the Prineville District incorporate District-specific geomorphological data into their cultural resource management program.

12. We suggest that all cultural resource projects (including surveys) involving prehistoric sites incorporate obsidian studies as part of the standard analyses. Obsidian hydration measurements and obsidian sourcing are relatively inexpensive methods of deriving chronological data, as well as contributing to our interpretations of resource use and exchange patterns. If samples of obsidian debitage were collected as a normal part of site recordation, then the sources of the specimens determined and hydration rinds measured, a relative temporal assignment could be made of specimens, and thus of sites, at a level probably more accurate than current projectile point cross-dating. These data will help address or develop research issues, and build or refine predictive models, which in turn will allow more efficient assessment of the sites. In addition, we recommend that the Prineville District develop an obsidian hydration rate (or rates), so that temporal placement of sites can be absolute, rather than relative.

PRIORITIZED ACTIONS

The purpose of this concluding section is to summarize and place the above recommendations into concrete, prioritized actions. Although we rank these recommendations, many are mutually independent, and can be conducted concurrently. We therefore have rated these into sets of priorities; the tasks within a given set can be started or conducted simultaneously.

PRIORITY 1

A. Improve cultural resource surveys. These suggestions are given Priority 1 status because cultural resource surveys are an ongoing process, the suggested changes are relatively simple and quickly completed, and the data provided are directly applicable to Priority 2 actions.

1. Add or alter fields in the ARCSITE database.
2. Update the site recordation and data entry manual (Bureau of Land Management 1989b), and incorporate the above suggestions.
3. Refine and implement the ARCSITE file data entry program.
4. Standardize survey methods.
5. Standardize a site definition for the artifact scatter site type.
6. Devise a method to record items falling below the current minimum site definition.
7. Collect samples of obsidian for use in obsidian studies.
    a. Determine the geologic sources.
    b. Measure hydration rind, and develop hydration rate.

B. Record data missing, or suspected to be incorrect, from previously recorded sites. This is placed with Priority 1 because the information retrieved should be included in subsequent tasks.

1. Compare locational data in survey reports with the database, and correct any errors.
2. Visit sites to retrieve missing information, and enter into the database. As a minimum, locational information should be derived from maps.

3. Note on site forms and in the database those sites that are on, or have been determined eligible for, the National Register.

C. Include, to a greater extent, Native American tribal organizations and their concerns in land management processes. This is Priority 1 task because it is a long-term commitment which should be started as soon as possible.

1. Undertake measures to increase cooperation and coordination between the BLM and Native American tribal organizations.
2. Incorporate Native American concerns for current and traditional use areas into management activities.
3. Identify, monitor, manage, and protect specific species of plants (and their environments) of economic value to Native Americans.

D. Initiate a PMOA with the SHPO and the ACHP. As a task requiring some time to complete, and involving a substantial amount of negotiations with SHPO and the ACHP, the process is best begun as soon as possible.

E. Implement a GIS. This is placed with Priority 1 because the information included will be beneficial in subsequent tasks. This system should:

1. Be compatible with the ARCSITE file.
2. Include the amount of area within the environmental variables discussed above.
3. Include basic survey information (location of the project, acreage inventoried, and number and type of sites documented).

PRIORITY 2

A. Develop a predictive model. This is a Priority 2 task because the model will be facilitated with the addition of data from Priority 1 tasks.

B. Gather additional information to expedite the evaluation process. This task will also benefit from the data provided by Priority 1 tasks.

1. Begin large-scale, research-oriented surveys and test excavations in physiographically discrete regions.
2. Inventory regions not currently well-represented in the database.
3. Instigate a geomorphological research effort.
4. Develop comprehensive research issues.
5. Expand and refine the predictive model as necessary.

PRIORITY 3

A. Instigate a program to document the wealth of existing, but largely untapped, data within the District. These tasks, which might be best implemented as an annual procedure, include:

1. Photographing, cataloging, assessing, and curating items and information contained in repositories throughout the District.
2. Recording oral histories with people knowledgeable about the history and prehistory of the region. The individuals listed in Table 7.1 are certainly candidates for this program, and others undoubtedly will be revealed as interviews are conducted.

B. Develop and implement a plan to increase public awareness regarding cultural resources. This plan should be considered a continually ongoing process, and might include:

1. Interpretive developments at BLM offices and specific cultural resource sites.
2. Brochures, pamphlets, or books aimed at the general public.
3. Periodic newsworthy releases to television stations and newspapers.
4. Presentations to schools and civic groups.

C. Implement measures to alleviate the loss of cultural resources.

1. Allay cultural resource vandalism through a program of:
    a. Aerial patrols in the lower sub-basins of the John Day and Deschutes rivers.
    b. Arresting and prosecuting looters to the fullest extent of the law.
    c. Site rehabilitation as discussed above.
    d. Monitoring to determine the magnitude of the problem.
    e. Data-recovery excavations in the high-impact areas.
    f. Enlisting the aid of local land-owners to monitor illegal activities.

2. Assuage destruction by natural forces. Identify sites subject to these forces, such as erosion, and stabilize.

3. Stop the loss of cultural resources to BLM land-use activities, through strict adherence to the review and compliance process.

D. Identify cultural resources eligible for special management designations, including, but not limited to, those sites discussed in these recommendations. This task will be greatly expedited by completion of Priority 2 tasks (specifically, development of research issues).

1. All the sites recorded on BLM-administered land along the lower Deschutes and John Day rivers should be incorporated in ACECs, as should those sites in lava caves.

2. Certain sites (listed above) should be formally evaluated against the National Register criteria. We suggest that the District nominate to the National Register a representative sample (those that can serve as "showcases") of those sites deemed eligible.

3. Record those historic sites for which National Register consideration has been given, but have no site forms.

E. Manage cultural resources, deemed particularly interesting to the District, in the following manner.

1. At the Macks Canyon Site (35SH23),
    a. Intensively survey and test-excavate the site area to determine the extent of cultural deposits.
    b. Reanalyze the portion of the site excavated by the University of Oregon, and produce a report meeting today's standards.

2. We recommend the ensuing steps be considered at Glass Buttes:
    a. Intensively survey the vicinity.
    b. Evaluate the sites as a National Register district.
    c. Examine the feasibility of a public interpretive site.
    d. Limit access via locked gates at access roads.
    e. Set aside a suitable location for contemporary obsidian quarrying.
        1. Intensively survey and document existing cultural resources within this location.
        2. Establish a permit system to allow continued quarrying within this location.

3. At Pictograph Cave, we suggest:
    a. Subsurface test-excavations to determine the extent of anthropic soil, and the degree of vandalism.
    b. Updating the site form to reflect the lithic component and to include all rock art.

4. We propose, along Oregon Trail locations on BLM land, that:
    a. The Fourmile Canyon segment interpretive site be upgraded.
    b. An interpretive site be considered for the McDonald Crossing.
    c. The District conduct an inventory of all potential Oregon Trail locations.

5. We suggest discreet test excavations at sites OR-05-560 and 562 on Big Summit Prairie to determine if these sites contain prehistoric house features. Protect the sites by:

    a. Restricting access to Big Summit Prairie by erecting locked gates at the entrances.
    b. Enlisting the aid of landowners to monitor the sites.

BLANK PAGE

8. BIBLIOGRAPHY

Abbott, Henry L.
1857 Report Upon Explorations for a Railroad Route from the Sacramento Valley to the Columbia River. In *Reports of Explorations and Surveys to Ascertain the Most Practicable and Economical Route for a Railroad*, vol. 6, 33rd Congress, 2nd Session, House Executive Documents 9l, Serial 763, Washington, D.C.

Aberle, David
1959 The Prophet Dance and Reactions to White Contact. *Southwestern Journal of Anthropology* 15(1):74-83.

Adams, John
1981 Recent Ethnology of the Northwest Coast. *Annual Review of Anthropology* 10:361-392.

Alexander, Jan
1989 *Cabell Mining and Milling*. Baker Ranger District, Wallowa-Whitman USDA National Forest, Baker, Oregon.

Allen, Barbara
l987 *Homesteading the High Desert*. University of Utah Press, Salt Lake City.

l989 Homesteading the High Desert: Examining the "Failed Frontier" from the Inside. *Idaho Yesterdays*. Fall:2-l2.

Allen, J. W.
n.d. The Military Road. Introduction by Lulu Crandell. Ms. in possession of H. G. Rees.

Allen, Miss A. J.
1850 *Ten Years in Oregon: Travels and Adventures of Doctor E. White and Lady*. Andrus, Gaunlett, Ithaca.

Alvord, Benjamin
1884 The Doctor-Killing Oregons. *Harper's New Monthly Magazine*, January:364-366.

American Media Company
l976 *Juniper Empire: Early Days in Eastern and Central Oregon, Prineville*. Timberline Publications, Prineville, Oregon.

Ames, Kenneth M., and Alan G. Marshall
1980 Villages, Demography and Subsistence Intensification on the Southern Columbia Plateau. *North American Archaeologist* 2(1):25-52.

Ammerman, Albert S.
1981 Surveys and Archaeological Research. *Annual Reviews in Anthropology* 10:63-88.

Amundson, Carroll John

1928 History of The Willamette Valley and Cascade Mountain Military Road Company. Unpublished Master's thesis, Department of History, University of Oregon, Eugene.

Anastasio, Angelo

1972 The Southern Plateau: An Ecological Analysis of Intergroup Relations. *Northwest Anthropological Research Notes* 6(2):109-229.

Anderson, Dale L.

1974 *The History and Preservation of the Lewis Anderson Homestead, Pleasant Ridge, Wasco County, Oregon*. Privately printed. Copy on file, Oregon Historical Society, Portland.

Anonymous

1880 Map of The Eastern Oregon and Winnemucca Wagon Road. Ms. on file, Oregon State Archives, Salem.

Anonymous

1962 Central Oregon's Pony Express Riders of 100 Years Ago.... *Bend Bulletin*, November 20, Bend, Oregon.

Anonymous

1982 *Cultural Resource Inventory Hampton Butte State BLM Land Exchange*. Submitted to USDI Bureau of Land Management, Portland.

Anonymous

n.d. History of Edward Hines Lumber Company in Harney and Grant Counties. Cited 1980, in *The Malheur National Forest: An Ethnographic History*, by Jerry L. Mosgrove. Ms. on file, USDA Forest Service, Malheur National Forest, John Day, Oregon.

Anonymous

n.d. *Crescent Lake Resort/Campground Archaeological Testing and Data Recovery*. USDA Forest Service, Deschutes National Forest, Crescent Ranger District, Bend, Oregon.

Antelope Saloon

1897-
1907 Journals. Ms. 488 on file, Oregon Historical Society, Portland. Not continuous.

Antevs, Ernst

1948 *The Great Basin, with Emphasis on Glacial and Post-glacial Times, Climatic Changes and Pre-white Man*. Bulletin of the University of Utah 38(2):108-191. Salt Lake City.

1955 Geologic-Dating in the West. *American Antiquity* 20:317-335.

Antone, Oregon
n.d. File on Antone, Oregon. Ms. RGL8/61-8/Item 2 on file, Oregon State Archives, Salem.

Appleby, Rex R.
1984 *West Wickiup Cultural Resources Report*. USDA Forest Service, Deschutes National Forest, Bend, Oregon. Submitted to USDA Forest Service, Deschutes National Forest, Bend, Oregon.

Applegate, Jesse
1914 *Recollections of My Boyhood*. Press of Review Publishing Company, Roseburg.

Armitage, Charles L.
1983 *An Archaeological Model of Settlement and Subsistence for the Central Oregon Paiute*. Master's thesis, Department of Anthropology, Idaho State University, Pocatello.

Armitage, Charles L., and Thomas L. Burge
1986 Archaeological Investigations in the Wind Creek Drainage, East-Central Oregon. Paper presented at the Northwest Anthropological Conference, Moscow, Idaho, March 27-29, 1986.

Armitage, Charles L., and Nancy Eide
1986 *Preliminary Archaeological Investigations at Site 35GR303*. USDA Forest Service, Ochoco National Forest, Paulina, Oregon. Submitted to USDA Forest Service, Prineville, Oregon.

Atherton, John A., and Michael C. Houck
1976 *An Introduction to the Natural History of Camp Hancock and the Clarno Basin, North Central Oregon*. The Oregon Museum of Science and Industry, Portland. Submitted to the National Science Foundation, Washington, D.C.

Auburn Ledger
1868 An Auburn Ledger of 1868. Transcript in the W.P.A. Papers, USO BX66.

Ayres, Garry G., Lorelea Hudson, and George F. Guazza
1978 Cultural Resource Overview of the Malheur, Umatilla and Whitman National Forests, 3 vols. Cultural Resources Consultants, Sandpoint, Idaho.

Bailey, Maida Rossiter
1901-
1962 Papers. Ms. 1633 on file, Oregon Historical Society, Portland.

Bailey, Barbara, and Mary Howell
1973 Upper Mill Creek Community; An Illustrated History. Ms. on file, Oregon Historical Society, Portland.

Bailey, Vernon
1936 *The Mammals and Life Zones of Oregon*. U. S. Department of Agriculture, Bureau of Biological Survey, North American Fauna 55. Washington, D.C.

Bain, Robert
1974 H.L. Davis. Boise State University Western Writers Series, No. 11, Boise.

Baker, Gail, C.
1949 Historical Summaries and Chronicles of the Deschutes National Forest. Ms. in possession of Gail Baker, updated to 1965.

Baldwin, Ewart M.
1986 Geology of Oregon. Third Edition. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Baldwin Sheep Company
1917-
1934 Papers of the Baldwin Sheep Company, vol. 1. Ms. on file, Oregon Historical Society, Portland.

Bancroft, Hubert Howe
1888 History of Oregon. Vol. 1, 1834-1848, and Vol. II, 1848-1888. The History Company, San Francisco.

Barlow, Jeffrey, and Christine Richardson
1979 China Doctor of John Day. Binford and Mort, Portland.

Beach, Margery
1985 The Waptashi Prophet and the Feather Religion: Derivative of the Washani. American Indian Quarterly 9(3):325-333.

Beckham, Stephen Dow
1979 The Barlow Road: A Historical Study. Ms. on file, USDA Forest Service, Mount Hood National Forest, Gresham, Oregon.

1974 The Oregon Trail in Oregon. Ms. on file, Oregon Department of Transportation, Salem.

1984 The La Pine B.L.M. Management Unit: A Cultural Resource Overview. Ms. on file, USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

1988 National Register Nomination for Maupin House, A Railroad Residence at Maupin. Ms. on file, USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Beckham, Stephen Dow, and Paul Baxter
1988 Cultural Resource Survey of Selected Tracts in the Bonneville Dam Reservoir Area, Oregon and Washington. Heritage Research Associates 73, Corps of Engineers, Portland.

Bedwell, Stephen F.
1969 Prehistory and Environment of the Pluvial Fort Rock Lake Area of South Central Oregon. Ph.D Dissertation, University of Oregon, Eugene.

Bedwell, Stephen F.
1973 Fort Rock Basin: Prehistory and Environment. University of Oregon Books, Eugene.

Belknap, Wilda Ketchum
n.d. Wilda Ketchum Belknap (1871-1957): Autobiographical Sketch. Ms. 304 on file, Oregon Historical Society, Portland.

Belshe, Bertha Helzer
1976 They Paved the Way. Sherman County Historical Museum, Moro, Oregon.

Bend Bulletin
1979 Central Oregon Beginnings. Supplement. On file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Benedict, Ruth
1923 The Concept of the Guardian Spirit in North America. American Anthropological Association Memoir 29.

Benson, Eva, Jean Peters, Margaret Edwards, and Louise Hogan
1973 Wild Edible Plants of the Pacific Northwest. Journal of the American Dietetic Association 62:143-147.

Benson, Robert L.
1973 Notes on Molala Ethnohistory. Ms. in Possession of Henry Zenk.

Bettis, Greg
1987 Indian Rock Art of the Lower Deschutes River. Greg Bettis, Portland.

Biddle, Henry
1926 Wishram. Oregon Historical Quarterly 27:113-130.

Bischoff, William N.
1950 The Yakima Indian War: 1855-56. Unpublished Ph.D. dissertation, University of Chicago, Loyola.

Black, Samuel
1829 Nez Perces Report. Hudson's Bay Company Archives B.146/e/2. Winnipeg.

Blake, Grover C.
n.d. Blazing Oregon Trails. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Blinn, Mayme Schwartz, and Richard Joseph Blinn
1977 Upper John Day River, Early Days in Prairie City. Caxton Printers, Caldwell, Idaho.

Boas, Franz
1890 Unpublished Molala Field-notes. Ms. on file, Bureau of American Ethnology Manuscript 999. Washington, D.C.

Bonneville Dam Fishing Rights Testimonies

1937 Documents from the National Archives, Sand Point Branch, Seattle. Ms.in Possession of Robert Boyd.

Boxberger, Daniel

1984 The Introduction of the Horse to the Southern Puget Sound Salish. In Western Washington Indian Socio-Economics: Papers in Honor of Angelo Anastasio. Edited by Herbert Taylor and Garland Grabert, pp. 103-119. Western Washington University, Bellingham.

Boyd, Robert

1985 The Introduction of Infectious Diseases Among the Indians of the Pacific Northwest, 1774-1874. Ph.D dissertation, Department of Anthropology, University of Washington, Seattle.

n.d. The Wascopam Mission Papers of the Reverend Henry Perkins. Ms. in possession of the author.

Boyd, Robert, and Yvonne Hajda

1987 Seasonal Population Movements Along the Lower Columbia River: The Social and Ecological Context. American Ethnologist 14(2):309-326.

Braly, David

1978 Tales From Oregon Outback. American Media Company, Timberline Publications, Prineville, Oregon.

1978 Cattle Barons of Early Oregon. American Media Company, Timberline Publications, Prineville.

Brauner, David, W. Robbins, and Kevin Howe

1979 Cultural Resource Survey Along the Proposed Bonneville Power Administration Celilo-Liberty Transmission Line Right-of-Way: Phase II. Department of Anthropology, Oregon State University, Corvallis, Oregon. Submitted to USDI Bonneville Power Administration.

Bretz, J.H., H.T.U. Smith, and G.E. Neff

1956 Channeled Scabland of Washington, New Data and Interpretations. Geological Society of America Bulletin 67:957-1040.

Brewer, Henry

1986 The Journal of Henry Bridgman Brewer, September 3, 1839 to February 13, 1843.... Edited by Richard Seiber. Ye Galleon, Fairfield.

Brimlow, George Francis

1938 The Bannock Indian War of 1878. Caxton Printers, Caldwell, Idaho.

1945 Goings-on in Canyon City, Oregon. Middle Border.

1946 Bulletin 5. Mitchell, South Dakota.

Brimlow, George Francis
1974 Pioneer Trails Dim in Range Land. *Oregon Historical Quarterly* 75 (4):309-315.

Brogan, Phil F.
1964 *East of the Cascades*. Edited by L. K. Phillips. Binfords & Mort, Portland.

Brooks, Howard, and Len Ramp
1968 Gold and Silver in Oregon. *Oregon Department of Geology and Mineral Industries Bulletin* 61.

Brown, Ed A.
1910 A Map of Central Oregon, 1910, compiled by Ed A. Brown. Ms. on file, Oregon Historical Society, Portland.

Bruce, Henrietta Steinke
1936 *A History of the Oregon Central Military Wagon Road Company with References to the Histories of Four Other Land Grant Companies in the State of Oregon*. Master's thesis, University of Oregon, Eugene.

Bruesch, William, and Virgina Bruesch
n.d. Historical Notes made at Almo, Idaho. On file with David Chance.

Brumfield, Kirby
1968 *This Was Wheat Farming: A Pictorial History of the Farms and Farmers of the Northwest Who Grow the Nation's Bread*. Bonanza Books, New York.

Brunton, Bill
1968 Ceremonial Integration in the Plateau of Northwestern America. *Northwest Anthropological Research Notes* 2:1-28.

Bryant, Richard L., and Linda Goddard
1979 Cultural Resource Overview of the Deschutes National Forest. Prepared by Prolysts, Inc., Eugene. Ms. on file, USDA Forest Service, Deschutes National Forest, Bend, Oregon.

Bryant, Paul T.
1978 *H. L. Davis*. Twayne Publishers.

Bureau of Land Management
1988 *BLM Manual Section 8100 - Cultural Resource Management*. USDI Bureau of Land Management.

1989a Schedules and General Provisions. Oregon/Washington State Office, USDI Bureau of Land Management, Portland.

1989b Automated Site Inventory Data System. Oregon/Washington State Office, USDI Bureau of Land Management, Portland.

Burell, Walter Frazer

n.d. Papers of Walter Frazer Burell (1863-1946). Ms. 1789 on file, Oregon Historical Society, Portland.

Burge, Thomas L., M. Glover, A. Gowan, C. Pope, and G. Popek

1985 *Preliminary Archaeological Investigations at the Dry Paulina Creek Site, 672NA293, Crook County, Oregon*. USDA Forest Service, Ochoco National Forest, Paulina, Oregon. Submitted to USDA Forest Service, Prineville, Oregon.

Burnett, Peter

1880 *Recollections and Opinions of an Old Pioneer*. D. Appleton, New York.

Butler, B. Robert

1957 The Art of the Lower Columbia Valley. *Archaeology* 10(3):58-165.

1959 Lower Columbia Valley Archaeology. A Survey and Appraisal of Some Major Archaeological Resources. *Tebiwa* 2(2):6-24

Cabell, Margaret M. C.

1979 Interview by Thomas Vaughan. Transcript on file, Oregon Historical Society, Portland.

Caldwell, Warren W.

1956 *The Archaeology of Wakemap, a Stratified Site Near the Dalles of the Columbia*. Ph.D. dissertation, Department of Anthropology, University of Washington, Seattle.

Calkins, D. Ordell

1982 Ione and Us: Historical Sketches of Ione, Morrow County, Oregon. Ms. on file, Oregon Historical Society, Portland.

Campbell, Arthur H.

1976 The Clarno Era: A Story of the Andrew Clarno Family and Their Settlement on the John Day River. Ms. 2513 on file, Oregon Historical Society, Portland.

1980 *John Day River; Drift and Historical Guide...for Raft, Drift Boat, Canoe, Kayak*. Frank Amato Publications, Portland.

1987 Charlie Clarno and the John Day Queen. *Oregon Historical Quarterly* 88 (4):349-369.

Campbell, Lyle, and Marianne Mitchum

1979 *The Languages of Native America: Historical and Comparative Assessments*. University of Texas Press, Austin.

Campbell, Sarah

1989 *Post Columbian Culture History in the Northern Columbia Plateau: A.D. 1500-1900*. Ph.D. dissertation, Department of Anthropology, University of Washington, Seattle.

Carey, Charles H.
1922 *History of Oregon*. 3 vols. Pioneer Historical Publishing Co., Portland.

Carlson, Roy
1989 Prehistoric Obsidian Trade. Map. Plate 14. In *Historical Atlas of Canada, Vol. 1:From the Beginning to 1800*. Edited by R. Cole Harris. University of Toronto Press, Toronto.

Carter, George E.
1966 The Cattle Industry in Eastern Oregon, 1880-90. *Oregon Historical Quarterly* 67 (1):139-159.

Carter, Ruth Seale
n.d. Reminiscences and Diaries. 1 vol. Ms. 1509 on file, Oregon Historical Society, Portland

Carter, Thomas
1937 Photographs of Columbia River Fishing Places Located Above Bonneville Dam. Yakima Agency Records, National Archives, Sand Point Branch, Seattle.

Caruso, John R.
1984 *Swampy Lakes LP Salvage Cultural Resource Report*. Deschutes USDA Forest Service, Deschutes National Forest, Bend, Oregon. Submitted to USDA Forest Service, Deschutes National Forest, Bend, Oregon.

Cazier, Lola
1976 Surveys and Surveyors of the Public Domain, 1785-1975. *Bureau of Land Management, Government Printing Office*, Washington, D. C.

Central Oregon Military Road
1902 Deed of all Right, Title, Interest, Claim and Demand. Ms. Bx 66 on file, University of Oregon Library Special Collections, Eugene.

Champion, A. J.
1938 The Mayflower Mining District. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Chance, David H.
n.d. Annals of the Snake War. 21 vols. Ms. in possession of David Chance.

Chapman
1859 Map of Oregon. Salem. Ms. on file Oregon Historical Society, Portland.

Chatters, James C.
1986 *Overview and Inventory of Cultural Resources in the Malheur Basin Project, Southeastern Oregon*. Archaeological Report 86-3. Central Washington University, Ellensburg, Washington.

Chen, Chia Lin
1971 The Golden Flower of Prosperity. Ms. on file, Kam Wah Chung Company, John Day, Oregon.

Chenowith, Justin
1872 Wasco County, Oregon: Land Survey of 1872. Ms. on file, Oregon Historical Society, Portland.

Clark, Cleon L.
1987 History of the Willamette Valley and Cascade Mountain Wagon Road. Ms. on file, Deschutes County Historical Society, Bend, Oregon.

Clark, John
1893 History of La Pine Pioneers. Ms. in possession of Stephen D. Beckham.

Clark, Keith
1976 Travelers at the Deschutes. *Oregon Historical Quarterly* 77 (1):79-81.

Clark, Keith, and Donna Clark
1978 William McKay's Journal, 1866-67: Indian Scouts. *Oregon Historical Quarterly* 79 (2):121-171; (3):268-333.

Clark, Keith, and Lowell Tiller
1966 *Terrible Trail: the Meek Cutoff, 1845*. Caxton Printers, Caldwell.

Clark, Linda, and Stephan Matz
1989 *Sutton Mountain Land Exchange Phase IV. Cultural Resource Evaluation Report, Wheeler County, Oregon*. USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Clark, Wanda
n.d. Scrapbook. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Cliff, Thelma Drake
1942 *A History of the Warm Springs Reservation: 1855-1900*. Master's thesis, University of Oregon, Eugene.

Clowers, Sharon
1984 *History of Jefferson County, Oregon, 1914-1983*, compiled by Sharon Clowers. Jefferson County Historical Society and The Taylor Publishing Company, Dallas, Texas.

Coe, U. C.
1940 *Frontier Doctor*. Macmillan Company.

Cole, David L.
1954 *A Contribution to the Archaeology of the Dalles Region, Oregon*. Master's thesis, Department of Anthropology, University of Oregon, Eugene.

Cole, David L.

1963 *Interim Report 1962-63, John Day Reservoir - FY 1962*. Museum of Natural History, University of Oregon, Eugene. Submitted to the USDI National Park Service, Region 4.

1964 Excavations at Wildcat Canyon, Site 35GM9, Area 5. In *Interim Report 1963-64, John Day Reservoir Project*. Museum of Natural History, University of Oregon, Eugene. Submitted to the USDI National Parks Service.

1965 *Report on Archaeological Research in the John Day Reservoir Area - 1964*. Museum of Natural History, University of Oregon, Eugene. Submitted to the National Park Service.

1966 *Report on Archaeological Research in the John Day Reservoir Area-1965, (Interim Report 1964-65)*. Report of the Museum of Natural History, University of Oregon, Eugene, for the National Park Service, Pacific Northwest Region, Seattle.

1967 *Archaeological Research of Site 35SH23, the Mack Canyonte Site*. Interim Report. Museum of Natural History, University of Oregon, Eugene.

1968 *Archaeological Excavations in Area 6 of Site 35 GM 9, the Wildcat Canyon Site, Interim Report 1968*. Museum of Natural History, Eugene, Oregon. Submitted to USDI National Parks Service.

1969 *1967 and 1968 Archaeological Excavations of the Mack Canyon Site*. Museum of Natural History, University of Oregon, Eugene. Submitted to USDI Bureau of Land Management, Portland.

1972 *Excavations at Site 35 GM 25 and Adjacent Areas*. Museum of Natural History, Eugene, Oregon. Submitted to Pacific Gas Transmission Company.

1974 *Archaeological Research in the Bonneville Dam Pool Area*. Museum of Natural History, University of Oregon, Eugene. Submitted to the USDI National Park Service.

1975 *Archaeological Survey in the Sun River Vicinity, Deschutes County, Oregon*. Museum of Natural History, Eugene, Oregon.

1977 *Archaeological Explorations at Sunriver, Deschutes County, Oregon*. Museum of Natural History, University of Oregon, Eugene. Submitted to USDA Forest Service, Deschutes National Forest, Bend, Oregon.

Cole, David L., and L. S. Cressman

1959 *Archaeological Investigations in the John Day Reservoir Area, Oregon; Interim Report for 1958-1959*. Department of Anthropology, University of Oregon, Eugene.

1960 *Interim Report 1959-1960, John Day Reservoir Project, Columbia River*. Department of Anthropology, University of Oregon, Eugene.

Cole, David L., and L. S. Cressman
1961 Interim Report 1960-1961, John Day Reservoir Project, Columbia River. Department of Anthropology, University of Oregon, Eugene.

Cole, David L., and Frank C. Leonhardy
1964 Report on Survey and Excavations of Blalock Island - 1963; Interim Report 1963-64, John Day Dam Reservoir Project, Columbia River, Part Two. Museum of Natural History, University of Oregon, Eugene.

Cole, David L., and T. H. Newman
1958 A Reappraisal of Archaeological Sites in the John Day Reservoir Area. University of Oregon, Department of Anthropology, Eugene.

Cole, David L., and Harvey S. Rice
1965 Archaeological Survey of the Proposed Oregon Dunes National Seashore. Report by the Museum of Natural History, University of Oregon, to the National Park Service. Eugene.

Cole, David L., and M. D. Southard
1971 Archaeological Survey of the Bonneville Dam Reservoir - 1971. Museum of Natural History, Eugene, Oregon. Submitted to Stanford Research Institute, Stanford.

Collier, H. A.
1914 Geology and Mineral Resources of the John Day Region. Mineral Resources of Oregon 1:(3), Oregon Bureau of Mines and Geology.

Combes, John D.
1961 An Archaeological Survey of Pacific Gas Transmission Company's Alberta to California Pipeline System: MP 108.0 to MP 722.0 Phase II. Department of Anthropology, Washington State University, Pullman. Submitted to Pacific Gas Transmission Company.

Connolly, Thomas J.
1983 An Archaeological Survey Near the Inn of the Seventh Mountain and Further Testing of Site 35DS57, Deschutes County, Oregon. Oregon State Museum of Anthropology, Eugene, Oregon. Submitted to the Inn of the Seventh Mountain, Bend, Oregon.

Conyers, E. W.
1906 Diary of E. W. Conyers, a Pioneer of 1852. Transactions of the Thirty-third Annual Reunion of the Oregon Pioneer Association, 423-512. Portland.

Cooper, Arvazena A. S.
1901 Our Journey Across the Plains from Missouri to Oregon in 1863. Ms. on file, Oregon Historical Society, Portland.

Corliss, Dave
1988 The Camp Watson Military Road. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Corning, Howard M.

1946 Joaquin Miller: Lawyer, Poet, Judge in Canyon City, edited by Howard M. Corning. *Oregon Historical Quarterly* 47:165-180.

1956 *Dictionary of Oregon History*. Binford and Mort. Portland.

Couture, Marilyn D.

1978 *Recent and Contemporary Foraging Practices of the Harney Valley Paiute*. Masters's thesis, Department of Anthropology, Portland State University. Portland.

Couture, Marilyn D., Mary F. Ricks, and Lucile Housley

1986 Foraging Behavior of a Contemporary Northern Great Basin Population. *Journal of California and Great Basin Anthropology* 8(2):150-160.

Cressman, Luther S.

1937 The Wickiup Damsite No. 1. Knives. *American Antiquity* 3(1):53-67.

1948 Odell Lake Site: A New Paleo-Indian Campsite in Oregon. *American Antiquity* 14:57-60.

1950 Archaeological Research in the John Day Region of North Central Oregon. *Proceedings of the American Philosophical Society* 94(4):369-385.

1963 *Final Report to the Portland General Electric Company on the Archaeological Salvage Program in the Round Butte Dam Reservoir, Jefferson County, Oregon*. Department of Anthropology, University of Oregon, Eugene. Submitted to the Portland General Electric Company.

Cressman, Luther S., and David Cole

1954 *Final Report, Site WS-1 (35-WS-2), Big Eddy, Oregon, and Site WS-4 (35-WS-8), Five Mile Rapids, Oregon*. Department of Anthropology, University of Oregon, Eugene. Submitted to the USDI National Parks Service.

1962 *Interim Report 1961-1962, John Day Reservoir-FY 1961*. Department of Anthropology, University of Oregon, Eugene. Submitted to the National Park Service, San Francisco.

Cressman, Luther S., David L. Cole, Wilbur A. Davis, Thomas M. Newman, and Daniel J. Scheans

1960 *Cultural Sequences at The Dalles, Oregon: A Contribution to Pacific Northwest Prehistory*. Transactions of the American Philosophical Society 50(10). Philadelphia.

Crook County High School

1905 History and Resources: Crook County, compiled by the students. Ms. on file, Crook County Historical Society, Prineville.

Crook County Historical Society

n.d. Pamphlet Series No. 1-124. Crook County Historical Society, Prineville

Cross, Osborne

1850 A Report, in the Form of a Journal, to the Quartermaster General, of the March of the Regiment of Mounted Riflemen to Oregon, From May 18 to October 5, 1849.... Report of the Quartermaster General, U. S. War Department Report, 1849/50. 31st Congress, 2nd Session, Appendix A, Document 3, pp. 126-244, Washington, D.C.

Crowley, Suzanne

1981 History of the Bureau of Land Management in Crook County. In *The History of Crook County, Oregon*. Crook County Historical Society, Prineville, Oregon.

1981 *Cultural Resource Survey Report of Lapine Salvage Timber Sale*. Prineville District, USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1981 *Cultural Resources Site Assessment Bonnieview Ranch Land Exchange*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1982 *Cultural Resource Survey Report Johnson Heights Timber Sale*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Culver, Grace Gabriel

1937 Memoirs. Cited in the University of Oregon Library Special Collections, Eugene. Box 17, 66.

Curtin, Jeremiah

1909 Wasco Tales and Myths. *American Ethnological Society Publications* 2. Leyden.

Curtis, Edward S.

1911 *The North American Indian*. Volume 8. Cambridge, Massachusetts.

Cushing, Milo M., and Mary P. Cushing

1971 Mary's Story, edited by Helen Cushing Rondeau. Ms. on file, Oregon Historical Society, Portland.

Darsie, Richard F., and James D. Keyser (editors)

1985 *Archaeological Inventory and Predictive Modelling in the Pacific Northwest*. Studies in Cultural Resource Management No. 6. USDA Forest Service, Pacific Northwest Region.

Daugherty, Richard D.

1956 Archaeology of the Lind Coulee Site, Washington. *Proceedings of the American Philosophical Society* 100(3):233-278.

1960 *An Archaeological Survey of Pacific Gas Transmission Company's Alberta to California Pipeline System, Idaho, Oregon, Washington*. Department of Anthropology, Washington State University, Pullman. Submitted to Pacific Gas Transmission Company.

Davies, K. G., A. M. Johnson, and Dorothy O. Johansen
1961 Snake Country Journal, 1826-27. Hudson's Bay Record Society, London.

Davis, Carl M.
1983 Deschutes National Forest Cultural Resource Inventory Plan. In Cultural Resource Inventory Plans: Documenting Inventory Strategies, edited by James D. Keyser, pp. 34-76. Studies in Cultural Resource Management 4. USDA Forest Service, Pacific Northwest Region.

Davis, Carl M., and Sara A. Scott
1986 Aspects of Upper Deschutes River Basin Prehistory, Central Oregon. In Contributions to the Archaeology of Oregon, 1983-1986, Association of Oregon Archaeologists Occasional Papers 3, edited by Kenneth M. Ames, pp. 102-128. Association of Oregon Archaeologists, Salem, Oregon.

Davis, H. L.
1986 Collected Essays and Short Stories. University of Idaho Press, Moscow.

Davis, Wilbur A.
1976 Interim Report: Survey of Prehistoric Cultural Resources, John Day Fossil Beds Natural Monument. Wilbur Davis, Corvallis, Oregon. Submitted to USDI National Parks Service, Condon, Oregon.

d'Azevedo, Warren
1986 Introduction. In Handbook of North American Indians, vol. 11. Great Basin, edited by William Sturtevant, Smithsonian Institution, Washington, D.C.

Dement, Margaret
1973 Historic Hay Creek Spread: Restoration of a Ranch. Capital Press, Salem. Copy on file, Jefferson County Historical Society, Madras, Oregon.

Deschutes County Historical Society
1985 A History of the Deschutes Country in Oregon. Deschutes County Historical Society, Bend, Oregon.

n.d. Deschutes Pioneers' Gazette, edited by Keith Clark, and Donna Clark. Deschutes County Historical Society, Bend, Oregon.

Deschutes Valley Tribune
1911 Deschutes Valley Tribune. On file, Jefferson County Historical Society, Madras, Oregon.

Desmond, Gerald
1952 Gambling Among the Yakima. Catholic University of America Anthropological Series 14.

Dicken, Samuel N., and Emily F. Dicken
1979 The Making of Oregon: A Study in Historical Geography. Oregon Historical Society, Portland.

Dobell, Joseph Porter

1948 Historical Notes. In Geology of the Antone District of Wheeler County, Oregon, by Joseph Porter Dobell. Unpublished Master of Science thesis, Oregon State College, Corvallis.

DOD Corps of Engineers

1985 Cultural Resources Management Plan John Day Project. DOD Corps of Engineers, Portland. Submitted to DOD Corps of Engineers, Portland.

Dodd, E. P.

n.d. Scrapbook History of Umatilla and Morrow Counties: 1902-1952. 1 vol. Ms. on file, University of Oregon Library Special Collections, Eugene.

Donnelly, E. W.

1936 Origin of the Name--Howard Valley. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Downing, Glenn, and Lloyd Furniss

1968 Some observations on Camas Digging and Baking Among Present-Day Nez Perce. Tebiwa 11(1):48-59.

Draper, John A.

1987 Data Recovery Plan for Chokecherry Cave (FS No. A-643-1000C) in East-Central Oregon, Malheur National Forest. Contributions in Cultural Resource Management 16. Center for Northwest Anthropology, Pullman, Washington.

Draper, John, and Kenneth Reid

1989 Archaeology of Chokecherry Cave, 35GR500, Grant County, Oregon. Center for Northwest Anthropology, Washington State University, Pullman. Submitted to USDA Forest Service, Malheur National Forest, John Day, Oregon.

Draper, John A., Kenneth Reid, and Peter Wigand

1987 Draft Silvies Valley Archaeological Project: Phase 1 Interim Report for 1986 Field Season. Contributions in Cultural Resource Management 17. Center for Northwest Anthropology, Washington State University, Pullman.

Drawson, Maynard C.

1977 John Day River Drift. In Treasures of the Oregon Country, vol. IV: 2-27, by Maynard C. Drawson. Published privately.

Driver, Harold, and William Massey

1957 Comparative Studies of North American Indians. Transactions of the American Philosophical Society 67:165-456.

Drury, Clifford

1958 The Diaries and Letters of Henry H. Spaulding and Asa Bowen Smith Relating to the Nez Perce Mission, 1838-1842. Arthur H. Clark, Glendale.

1973 Marcus and Narcissa Whitman, and the Opening of Old Oregon. Arthur H. Clark, Glendale.

DuBois, Cora

1938 The Feather Cult of the Middle Columbia. *General Series in Anthropology* 7. George Banta, Menasha.

Ducey, Brent E.

1963 *Hell on Hogthieves and Hypocrites*. Master's thesis, University of Oregon, Eugene.

Due, John Fitzgerald, and Giles French

1979 *Rails to the Mid-Columbia Wheatland: the Columbia Southern and Great Southern Railroads and the Development of Sherman and Wasco Counties, Oregon*. University Press of America, Washington D.C.

Dumond, Don E., and Rick Minor

1983 *Archaeology in the John Day Reservoir: The Wildcat Canyon Site, 35-GM-9*. University of Oregon Anthropological Papers 30. Eugene.

Dunnell, Robert C., and William S. Dancey

1983 The Siteless Survey: A Regional Scale Data Collection Strategy. In *Advances in Archaeological Method and Theory*, edited by Michael B. Schiffer, vol. 6, pp. 267-287. Academic Press, New York.

Eastern Oregon Banking Company

1900-
1937 Papers of the Eastern Oregon Banking Company. Ms. 311 on file, Oregon Historical Society, Portland.

Edson, C. H.

1970 *The Chinese in Eastern Oregon, 1860-90*. Master's thesis, University of Oregon, Eugene.

Ellis, David V.

1984 *Excavations at the Deschutes Park West Site (35WS143) Wasco County, Oregon*. CRM Report 5. Willamette Associates, Portland.

Enneberg, Marci

1987 *Oregon Cultural Resource Survey Report Muhly Lake*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1987 *Oregon Cultural Resource Survey Report Mud Creek Rehabilitation*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Ericksen, Sheldon D.

1953 Occupance in the Upper Deschutes Basin, Oregon. *Research Papers* No. 32. Department of Geography, University of Chicago, Chicago.

Ewart, Shirley
1988 A Long and Wearisome Journey: The Eakin Family Diaries: 1866. Ms. on file, Sherman Historical Museum, Moro, Oregon.

Fagan, John L.
1974 *Altithermal Occupation of Spring Sites in the Northern Great Basin*. University of Oregon Anthropological Papers 6. Eugene.

Fagan, John L., and Garry L. Sage
1974 New Windust Sites in Oregon. *Tebiwa* 16(2):68-71.

Farnham, Thomas
1841 *Travels in the Great Western Prairies, the Anahuac and Rocky Mountains, and in the Oregon Territory*. Killey and Lossing, Poughkeepsie, New York.

Farrell, Allie M.
1957 *Jefferson County Reminiscences*, edited by Allie M. Farrell. Binford and Mort, Portland.

Filloon, Roy
1952 Huckleberry Pilgrimage. *Pacific Discovery* 5:4-13.

Flenniken, Jeffrey, and Terry Ozbun
1988 *Archaeological Test Excavations of Three Sites in the Ochoco National Forest*. Lithic Analysts 2, Pullman, Washington. Submitted to USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Florin, Lambert
1970 *Oregon Ghost Towns*. Superior Publishing Company, Seattle.

Follansbee, Julia A.
1979 *An Evaluation of the Abbott Site 35 WS 115*. Cultural Resource Management, Inc., Eugene, Oregon. Submitted to DOE Bonneville Power Administration, Portland.

Follansbee, Julia A., and Ellen E. Frances
1980a An Assessment of the Potential National Register Eligibility of the Bend- Prineville Wagon Road and Archaeological Site 35-DS-54. Report on file, Cultural Resource Management, Inc., Eugene.

1980b *Rock Features and Military Maneuvers in Central Oregon*. Cultural Resource Management, Inc., Eugene, Oregon. Submitted to Bend Engineering Consultants, Bend, Oregon.

Follansbee, Julia A., and Ellen B. Mays
1979 *A Preliminary Cultural Resource Overview for the Brownlee-Slatt and Buckley-Malin Corridors, Oregon*. Julia A. Follansbee, Eugene, Oregon. Submitted to DOE Bonneville Power Administration, Portland.

Fowler, Catharine

1986 Subsistence. In Great Basin, edited by Warren d'Azevedo, pp. 64-97. Handbook of North American Indians, vol.11, William G. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Fowler, Catharine, and Sven Liljeblad

1986 Northern Paiute. In Great Basin, edited by Warren d'Azevedo, pp. 435-465. Handbook of North American Indians, vol. 11, William Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Fowler, Don, and Jesse D. Jennings

1982 Great Basin Archaeology: A Historical Overview. In Man and Environment in the Great Basin, edited by David Madsen and James O'Connell, pp. 05-120. Society for American Archaeology Paper 2. Washington, D.C.

Frachtenberg, Leo J.

1910-
1911 Molala Fieldnotes. Ms. on File, Melville Jacobs Collection, University of Washington Archives, Seattle.

1911 Molala Ethnography. Ms. 2517 on File, National Anthropological Archives, Smithsonian Institution, Washington, D.C.

Franklin, Jerry F., and C. T. Dyrness

1988 Natural Vegetation of Oregon and Washington. Oregon State University Press, Corvallis.

Franzwa, Gregory M.

1988 The Oregon Trail Revisited. 4th edition. Patrice Press, St. Louis.

Fremont, John Charles

1966 Report of the Exploring Expedition of the Rocky Mountains (in 1842 and 1843-44). 28th Congress, 2nd Session, Senate Executive Documents 174.

French, David

1957 Aboriginal Control of Huckleberry Yield in the Northwest. Paper presented at the Annual Meetings of the American Anthropological Association, Chicago.

1961 Wasco-Wishram. In Perspectives in American Indian Culture Change, edited by Edward Spicer, pp. 337-430. University of Chicago Press, Chicago.

1965 Ethnobotany of the Pacific Northwest Indians. Economic Botany 19:378-382.

1981 Neglected Aspects of North American Ethnobotany. Canadian Journal of Botany 59:2326-2330.

n.d. Wasco, Wishram, and Cascades. In Plateau, edited By Deward Walker. Handbook of North American Archaeology, vol. 12, edited by William Sturtevant. Smithsonian Institution, Washington, D.C., in press.

French, David, and Kathrine French
1951-
1955 Field Notes, Wasco and Sahaptin, Warm Springs Reservation. Ms in possession of the authors.

French, Giles
1958 *The Golden Land: A History of Sherman County, Oregon*. Oregon Historical Society, Portland.

1971 *Homesteads and Heritages: A History of Morrow County, Oregon*. Report submitted to the Morrow County History Committee, Portland. Binford and Mort, Portland.

French, Kathrine
1955 *Cultural Segments and Variation in Contemporary Social Ceremonialism on the Warm Springs Reservation, Oregon*. Ph.D. dissertation, Department of Anthropology, Columbia University, New York.

French, Kathrine, and Yvonne Hajda
1985 The Changing Structure of Warm Springs Alliances. Paper Read at the 84th Annual Meeting of the American Anthropological Association, Washington, D.C.

Friedman, Edward
1978 *Cultural Resource Evaluation of Mining Cabin Boulder Timber Sale*. Wallowa-Whitman USDA Forest Service, Baker, Oregon. Submitted to Wallowa-Whitman USDA Forest Service, Baker, Oregon.

Friends of the Maupin Library
1986 *Chaff in the Wind: Gleanings of the Maupin Community*. Friends of the Maupin Library, Maupin, Oregon.

Frost, O. W.
1967 *Joaquin Miller*. Twayne Publishers, New York.

Fulton, Leonard
1968 Spawning Areas and Abundance of Chinook Salmon in the Columbia River Past and Present. *Fish and Wildlife Service Special Scientific Report: Fisheries* 57, Washington, D.C.

1970 Spawning Areas and Abundance of Steelhead Trout and Coho, Sockeye, and Chum Salmon in the Columbia River Basin: Past and Present. *National Marine Fisheries Special Scientific Report: Fisheries 618*, Washington, D.C.

Fussner, F. Smith
1975 *Glimpses of Wheeler County's Past*. Report submitted to The Wheeler County Historical Commission, Portland. Binfords and Mort, Portland.

Gabrielson, Ira, and Stanley Jewett
1940 *Birds of Oregon*. Oregon State College. Corvallis.

Galvin, John (editor)

1964 Fr. Miguel de la Campa: A Journal of the Explorations Northward Along the Coast of Monterey in the Year 1775. John Howell Books.

Gannon, Brian L.

1968 Preliminary Report on the Archaeology of Cove Creek-2 (35WH7), Wheeler County, Oregon. Oregon Museum of Science and Industry, Portland.

1970 Preliminary Report on an Archaeological Site in the Clarno Basin of North Central Oregon, 35WH7 (Cove Creek-2). Oregon Museum of Science and Industry, Portland.

1972a Archaeological Research on 35WH21 (Jones Canyon-2). Oregon Museum of Science and Industry, Portland.

1972b Investigations of an Archaeological Site in the Clarno Basin of North Central Oregon. Abstract.

1975a Archaeological Research in the Clarno Basin of North Central Oregon. Interim Report. Oregon Museum of Science and Industry, Portland.

1975b Synopsis of Archaeological Research in the Clarno Basin North-Central Oregon: 35WH13 and 35WH21. Oregon Museum of Science and Industry, Portland. Submitted to State Historic Preservation Office, Salem, Oregon.

1978 Synopsis of Archaeological Research in the Clarno Basin North-Central Oregon: 1970-1977. Oregon Museum of Science and Industry, Portland. Submitted to State Historic Preservation Office, Salem, Oregon.

1979 Archaeological Studies in the Clarno Basin of North Central Oregon: Major Developments of the 1978 Field Season. Oregon Museum of Science and Industry, Portland. Submitted to the National Science Foundation, Washington, D.C.

Gannon, Brian L., Charles Hibbs, and Cynthia Willard

1977 Cultural Resources Inventory of BLM Lands, Lower Deschutes River, Oregon. Ms. on file, USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Garth, Thomas

1964 Early Nineteenth Century Tribal Relations in the Columbia Plateau. Southwestern Journal of Anthropology 20:43-57.

1965 The Plateau Whipping Complex and its Relationship to Plateau-Southwest Contacts. Ethnohistory 12(2):141-170.

Gary, George

1923 Diary of Rev. George Gary. [1849] Edited by Charles Carey. Oregon Historical Quarterly 24.

Gates, Paul W.

1968 History of Public Land Law Development. Public Land Law Review Commission. Government Printing Office, Washington, D.C.

1979 The Homestead Act: Free Land Policy in Operation, 1862-1935. In Public Land Policies: Management and Disposal, edited and with an introduction by Paul W. Gates 28-46. Arno Press, New York.

Gatschet, Albert

1877a Molala Linguistic Texts. Oregon State Library, Salem. Microfilm 32-A.

1877b Texts, Sentences, and Vocables of the Atfalati Dialect of the Kalapuya Language.... National Anthropological Archives, Smithsonian Institution, Washington, D.C., Ms. 472-a.

Genealogical Forum of Portland, Oregon

1979 Wasco County Cemetery Records. Ms. on file Oregon Historical Society, Portland.

Gibbs, George

1854 Report of Mr. George Gibbs to Captain Mc'Clellan, on the Indian Tribes of the Territory of Washington, 3/4/54. House Executive Document 129, Report of Exploration of a Route for the Pacific Railroad..., 33rd Congress, 1st Session, pp. 419-465, Washington, D.C.

1956 Account of Indian Mythology in Oregon and Washington Territory, 1865, edited by Ella Clark. Oregon Historical Quarterly 57.

Gibson, Eric C.

1989 A Cultural Resources Survey of the FY 1990 La Pine, Oregon, Timber Sale. Infotec Research, Inc., Eugene, Oregon. IRI Report No. PNW89-3. Submitted to USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Gibson, Eric C., and Richard M. Pettigrew

1989 Archaeological Investigations at Eagle Crest Site (OR-05-792), Deschutes County, Oregon. IRI Report No.PNW89-7. Submitted to USDI Bureau of Land Management, Prineville, Oregon.

Gilliam, Cornelius

n.d. Correspondence and Data on the Cayuse War. Ms. 2205 on file, Oregon Historical Society, Portland.

Gilliam County Historical Society

1981 The History of Gilliam County, Oregon. Gilliam County Historical Society.

1983 A Pictorial History of Gilliam County, Oregon. Taylor Publishing Company, Dallas, Texas.

Gilsen, Le

1984 *Deschutes River Scenic Waterway Parking Lot/Boat Ramp Wasco County*. State Historic Preservation Office, Salem, Oregon. Submitted to Oregon State Parks and Recreation, Salem, Oregon.

1988 *Test Excavations at 35WS220 Mayer State Park*. State Historic Preservation Office, Salem, Oregon.

Glassley, Ray H.

1953 *Pacific Northwest Indian Wars*. Binford and Mort, Portland.

Goddard, Linda, and R. Bryant

1979 *Cultural Resource Overview: Deschutes National Forest, Oregon*. Prepared for Deschutes National Forest by Pro-Lysts, Inc. Eugene, Oregon.

Goheen, Andrew M.

1981 *Report on the Big Baldy Timber Sale Archaeological Survey*. Burns District USDI Bureau of Land Management, Burns, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1982 *Report of the Smyth Creek Seeding Re-Survey Project*. Burns District USDI Bureau of Land Management, Burns, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Goheen, Andrew M., and Leslie J. Hosford

1982 *Report on the Archaeological Survey of the Proposed John Day/Canyon City Expansion Project*. Burns District USDI Bureau of Land Management, Burns, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Gould, Robert B.

1930 *Deschutes Valley*. Updated. Originally printed in 1915, and updated 1921. Ms. on file, Deschutes Historical Society, Bend, Oregon.

n.d. *Map of the Deschutes Valley, Central Oregon*. Ms. on file, Oregon Historical Society, Portland.

Gowan, Amy A.

1986 The Summit Trail: A History, Comprehensive Survey and Evaluation, Ochoco National Forest. 2 parts. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Grant County

1865 Ledger, Circuit Court Records, and Pages of Poems by Joaquin Miller. Ms. 6 on file, Oregon Historical Society, Portland.

1865-
1870 Rock Creek Mining District Script Receipt Records. Ms. on file, Grant County, Oregon.

Grant County

1865-
1870 Rock Creek Mining District Records. 1 vol. Ms. on file, Grant County, Oregon.

1866-
1894 Brand Book. Ms. on file, Oregon State Archives, Salem.

1869-? Rock Creek Mining District Tax Assessment Rolls. 14. vols. Ms. on file, Grant County, Oregon.

n.d. Examples of Grant County Records at Oregon State Archives. Ms. on file Oregon State Archives, Salem.

n.d. Rock Creek Mining District Plat Books. Ms. on file, Grant County.

Grant County Historical Society (Oliver Museum)

1983 *The History of Grant County, Oregon, 1862-1983*. Taylor Publishing Company, Dallas.

Gray, Edward

1986 *Roughing It on the Little Deschutes River, 1934-1944: a History of a Sawmill Camp and its People*. K & M Printing, Eugene, Oregon.

Grayson, Donald K.

1979 Mount Mazama, Climatic Change, and Fort Rock Archaeofaunas. *Volcanic Activity and Human Ecology*, edited by Payson D. Sheets and Donald K. Grayson, pp. 427-458. Academic Press, New York.

Green, Kenneth

n.d. Map of Jefferson County. Ms. on file, Jefferson County Historical Society, Madras.

Greenhoot, Gilma Endicott

1988 *Rattlesnake Homestead*. Published by Gimla Endicott Greenhoot, Springfield, Oregon. Copy on file, Jefferson County Historical Society, Madras.

Gribskov, Joyce Armstrong

1984 *Pioneer Spirits of Bend*, edited by Margaret Sandoz. Publisher unknown.

Griffin, Dennis

1984 *Cultural Resource Survey Report 96 Pipeline*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1986 Prehistoric Utilization of Thermal Springs in the Pacific Northwest. In *Contributions to the Archaeology of Oregon, 1983-1986*, edited by Kenneth M. Ames, pp. 62-79. Association of Oregon Archaeologists Occasional Papers No. 3.

Griffin, Dennis C., and Deborah L. Soper

1984 *Class II Cultural Resource Survey of the Cherry Creek Area North Central Oregon*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1984 *Cultural Resource Survey Report Spring Creek Prescribed Burn*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1984 *Cultural Resource Survey Report N.E. 7 Pasture Prescribed Burn*. Prineville District USDI Bureau of Land Management, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Gunther, Erna

1926 Analysis of the First Salmon Ceremony. *American Anthropologist* 28:605-618.

1928 A Further Analysis of the First Salmon Ceremony. *University of Washington Publications in Anthropology* 2(5):129-173, Seattle.

1950 The Westward Movement of Some Plains Traits. *American Anthropologist* 51:174-180.

Guyton, Ada Bell

n.d. Diary, 1897-1950. Ms. in possession of H. G. Rees.

Haight, Margaret Mary

1936 Joaquin Miller in Oregon: 1852-54 and 1857-1870. Unpublished Master's thesis, University of Oregon, Eugene.

Haines, Francis

1938 The Northward Spread of Horses Among the Plains Indians. *American Anthropologist* 40(3):429-437.

1960 Nez Perce Horses: How They Changed the Indian Way of Life. *Idaho Yesterdays* 4:8-11.

Haines, Francis D., Jr.,(editor)

1971 *The Snake Country Expedition of 1830-31, John Work's Field Journal*. University of Oklahoma Press, Norman.

Hajda, Yvonne

1984 *Regional Social Organization in the Greater Lower Columbia, 1792-1830*. Unpublished Ph.d. dissertation, Department of Anthropology, University of Washington, Seattle.

1987 Exchange Spheres on the Lower Columbia. Paper Presented at the 86th Annual Meeting of the American Anthropological Association, Chicago.

Hajda, Yvonne, and Katharine French
1985-
1989 Field Notes. Ms. in possession of the authors.

Hale, Horatio
1846 *Ethnography and Philology*. C. Sherman, Philadelphia.

Halvorsen, Henry H.
1982 *Padberg-Halvorsen*. Medford, Oregon. Copy on file, Oregon Historical Society, Portland.

Hansen, Henry P.
1942 Post-Mount Mazama Forest Succession on the East Slope of the Central Cascades of Oregon. *American Midland Naturalist* 27(2):523-534.

1946 Postglacial Forest Succession and Climate in the Oregon Cascades. *American Journal of Science* 244(10):710-734.

1947a Postglacial Forest Succession, Climate, and Chronology in the Pacific Northwest. *Transactions of the American Philosophical Society* 37.

1947b Postglacial Vegetation of the Northern Great Basin. *American Journal of Botany* 34:164-171.

Hansen, Laura B. V.
1980 *The High Desert, the Low Desert, and the Plainview Years*. Redmond, Oregon.

Harper, Edward
1951-
1953 Paiute Field Notes and Myths. Ms. on File with David and Kathrine French.

Hardesty, Donald L.
1988 *The Archaeology of Mining and Miners: A View from the Silver State*. Society for Historical Archaeology Special Publication Series, No. 6. Braun-Brumfield, Inc., Ann Arbor, Michigan.

Harper, J. Russell (editor)
1971 *Paul Kane's Frontier*. University of Texas Press, Austin.

Harris, Bruce
1983 *The Wasco County History Book*. Published by Bruce Harris, The Dalles, Oregon.

Harritt, Jesse
1913 *Diary of 1845*. Transactions of the 39th Annual Reunion of the Oregon Pioneer Association, 1911.

Hartdwick, Henry James
1987 Tygh Valley and Wamic, Oregon, Funerals, Wasco County, 1940-1952: Officiated by Rev. H. James Hartdwick. Compiled by Gene A. Savage, Cottage Grove. Ms. on file, Oregon Historical Society, Portland.

Hartman Family
n.d. Papers. Ms.2390 on file, Oregon Historical Society, Portland.

Hartmann, Glenn D.
1985 *A Cultural Resources Overview and Sampling Survey of the Commercial Timber Lands of the Warm Springs Indian Reservation, Oregon*. Archaeological and Historical Services Report 100-43. Eastern Washington University, Cheney.

Hatton, Raymond R.
1978 *Bend in Central Oregon*. Binford and Mort, Portland.

1980 *High Country of Central Oregon*. Binford and Mort, Portland.

1982 *Pioneer Homesteaders of the Fort Rock Valley*. Binford and Mort, Portland.

1988 *Oregon's Big Country: A Portrait of Southeastern Oregon*. Maverick Publications, Bend, Oregon.

n.d. Index to the Bend Bulletin. Ms. on file, Deschutes County Library, Bend.

Heald, R. P.
1922 Geographical, Commercial and Recreational Survey Map of Oregon. In *Survey Index of the State of Oregon*, by R. P. Heald. Heald-Menerey Co., Portland.

Hein, C. E.
1977 Sheepherding/Industry has Almost Vanished. *Bend Bulletin*. Copy on file, Jefferson County Historical Society, Madras.

Heizer, Robert
1942 Walla Walla Indian Expeditions to the Sacramento Valley, 1844-1847. *Quarterly of the California Historical Society* 21(1):1-7.

Helms, Irene Higgens
1980 *Remembering, School Days of Old Crook County*. Print Shop, Prineville.

Helms, William H.
n.d. Reminiscences. Ms. 2612 on file, Oregon Historical Society, Portland.

Heusser, Calvin S.
1966 Pleistocene Climatic Variation in the Western United States. In *Pleistocene and Post-Pleistocene Climatic Variations in the Pacific States*, edited by D. I. Blumenstock, pp. 9-36. Bishop Museum Press, Honolulu.

Hibbard, Benjamin Horace
1965 *A History of the Public Land Policies*. 3d edition. University of Wisconsin Press, Madison.

Hibbs, Charles H.
1978 Cultural Resource Investigations of Cow Creek Camp (Cabin R.S.). USDA Forest Service, Ochoco National Forest, Prineville, Oregon. Submitted to USDA Forest Service, Prineville, Oregon.

Hibbs, Charles H., Brian L. Gannon, and Cynthia H. Willard
1976 Lower Deschutes River Cultural Resources Survey: Warm Springs Bridge to Macks Canyon, Sherman, Wasco, and Jefferson Counties. USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Hiday, Mrs. Harry I.
1965 United States Census of Wasco County, Oregon, 1880, compiled by Mrs. Harry I. Hiday. Ms. on file, Oregon Historical Society, Portland.

1965 United States Census of Wasco County, Oregon, 1870, compiled by Mrs. Harry I. Hiday. Ms. on file, Oregon Historical Society, Portland.

Hillgen, Marcella
1938 The Wascopam Mission. Oregon Historical Quarterly 39:221-234.

Hilty, Ivy,
1972 Nutritive Values of Native Foods of the Warm Springs Indians. Oregon State University Circular 809, Corvallis.

Hines, Gustavus
1850 A Voyage Round the World: With a History of the Oregon Mission.... Derby and Company, Buffalo.

Hirsch, Dorothy D.
1976 The Baldwin Sheep and Land Company, 1873-1910. Unpublished Master's thesis, Portland State University, Portland.

Hitchcock, C. Leo
1973 Flora of the Pacific Northwest. University of Washington Press, Seattle.

Hoag, Ella Lillian
1918 A History of Shaniko: By an Eighth Grader. Ms. 1504 on file, Oregon Historical Society, Portland.

1980 Interview. On file, Oregon Historical Society, Portland. Cassette.

Hodgson, Allen H.
1913 History of the Ochoco National Forest. Updated 1940-?. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Holbrook, Stewart H.
1974 The Columbia. Holt, Rinehart and Winston, New York.

Hood River County Historical Society

1982 The History of Hood River County, Oregon, 1852-1982. Taylor Publishing Company, Dallas.

Houck, Michael C., and John H. Atherton (editors)

1977 The Natural History of Camp Hancock and the Clarno Basin, North Central Oregon. Oregon Museum of Science and Industry, Portland.

Hudson, Lorelea, G. G. Ayers, G. F. Gauzza, and J. Randolph

1978 Cultural Resource Overview of the Malheur, Umatilla and Wallowa-Whitman Forests, Northeast Oregon/Southeast Washington, Volume I & II. Cultural Resource Management Reports 1.

Hughes, Richard E.

1986 Diachronic Variability in Obsidian Procurement Patterns in Northeastern California and Southcentral Oregon. University of California Publications in Anthropology 17.

Hulbert, Archer, and Dorothy Hulbert (editors)

1936-
1941 Marcus Whitman, Crusader, parts 1, 2, 3. In Overland to the Pacific, vol.6-8. Denver Public Library.

Hunn, Eugene

1980 Sahaptin Fish Classification. Northwest Anthropological Research Notes 14(1):1-19.

1981 On the Relative Contribution of Men and Women to Subsistence Among Hunter-Gatherers of the Columbia Plateau: A Comparison With Ethnographic Atlas Summaries. Journal of Ethnobiology 1(1):123-134.

1982 Mobility as a Factor Limiting Resource Use in the Columbia Plateau of North America. In Resource Managers: North American and Australian Hunter-Gatherers, edited by Nancy Williams and Eugene Hunn, pp. 17-43. AAAS Selected Symposium 67. Westview Press, Boulder.

1990 Nch'i Wana ("The Big River"): Mid-Columbia River People and Their Land. University of Washington Press, Seattle.

Hunn, Eugene, and David French

1981 Lomatium: A Key Resource for Columbia Plateau Native Subsistence. Northwest Science 55(2):87-94.

Hunt, Clarence Norman

n.d. The Life and Times of C. N. Hunt. Ms. on file, Oregon historical Society, Portland.

Hymes, Dell

1981 Ethnological Note. In Vain I Tried To Tell You: Essays in Native American Ethnopoetics, pp. 15-23. University of Pennsylvania, Philadelphia.

Ice, Dannie M.
1962 Archaeology of the Lava Butte Site, Deschutes County, Oregon. Washington State University, Pullman. Submitted to Pacific Gas Transmission Company.

Indian Claims Commission
1960 Commission Findings, The Confederated Tribes of the Warm Springs Reservation of Oregon v. United States of America, Docket No. 198. In Oregon Indians II, pp.181-332. Garland Publishing, Inc., New York.

Irving, Washington
1961 The Adventures of Captain Bonneville U.S.A. in the Rocky Mountains and the Far West. University of Oklahoma Press, Norman.

Irwin, Ann M., and Ula Moody
1978 The Lind Coulee Site (45GR97). Washington Archaeological Research Center, Washington State University, Pullman. Submitted to the U.S. Bureau of Reclamation.

Jackson, Donald, and Mary Lee Spence (editors)
1970 The Expeditions of John Charles Fremont, vol. 1: Travels From 1838 to 1844. University of Illinois Press, Urbana.

Jackson, Philip L.
1985 Climate. In Atlas of the Pacific Northwest, edited by Jon A. Kimerling and Philip L. Jackson, pp. 49-57. Oregon State University Press, Corvallis.

Jackson, Turrentine
1949 Federal Road Building Grants for Early Oregon. Oregon Historical Quarterly 50 (1):3-29.

1952 Wagon Roads West: A Study of Federal Road Surveys and Construction in the Trans-Mississippi West, 1846-1869. University of California Press, Berkeley.

Jacobs, Melvile
1928-
1936 Santiam Kalapuyan Fieldnotes. Ms. on File, Melville Jacobs Collection, University of Washington Archives, Seattle.

1929 Field Notebook 52. Ms. on File, Melville Jacobs Collection, University of Washington Archives, Seattle.

Jefferson County Historical Society
1984 Jefferson County, Oregon, 1914-1983. Taylor Publishing Company, Dallas, Texas.

n.d. A History of Jefferson County Pioneers. Jefferson County Historical Society, Madras, Oregon.

Jenkins, Dennis
1988 Testing and Evaluation of Mitchell Cave (35WH122), Wheeler County, Oregon. Oregon State Museum of Anthropology Report 88-5, Submitted to Oregon DOT.

Jenkins, Dennis L., and Thomas J. Connolly

1987 Phase II Archaeological Testing of the Mitchell Cave Site (35WH122), Within the Mitchell-Keyes Creek Summit Section of the Ochoco Highway (US26), Wheeler County. Oregon State Museum of Anthropology, Eugene, Oregon. Submitted to Oregon Highway Division, Salem, Oregon.

Jenkins, Paul Christy

1986 Archaeological Testing of the Lancer Relog Site for Rock Ranger District Deschutes National Forest. Coastal Magnetic Search & Survey Report 14. Salem, Oregon.

Jennings, Jesse D.

1974 Prehistory of North America. McGraw-Hill, New York.

Jochim, Michael A.

1976 Hunter-gatherer Subsistence and Settlement: A Predictive Model. Academic Press, New York.

1979 Breaking Down the System: Recent Ecological Approaches in Archaeology. Advances in Archaeological Method and Theory 2:77-117. Academic Press, New York.

Johannessen, Carl L., W. A. Davenport, Artimus Millet, and S. McWilliams

1971 The Vegetation of the Willamette Valley. Annals of the Association of American Geographers 61:286-302.

Johansen, Dorothy O.

1967 Empire of the Columbia. Harper and Row Publishing, New York, New York.

Johnson, Isabelle

1972 Archaeology Research on 35WH21 (Jones Canyon 2). Preliminary report, Oregon Museum of Science and Industry, Portland.

Joint Committee on Military Wagon Roads

1888 Report, February 14. Oregon House Journal, 1885,459-462.

Jones, George T.

1984 Prehistoric Land Use in the Steens Mountain Area, Southeastern Oregon. Ph.D. Dissertation, Department of Anthropology, University of Washington, Seattle.

Jorgensen, Joseph

1980 Western Indians: Comparative Environments, Languages, and Cultures of 172 Western American Indian Tribes. W. H. Freeman, San Francisco.

Josephy, Alvin

1965 The Nez Perce Indians and the Opening of the Northwest. Yale University Press, New Haven.

Judge, W. James, and Lynne Sebastian (editors)
1988 Quantifying the Present and Predicting the Past: Theory, Method, and Application of Archaeological Predictive Modeling. USDI Bureau of Land Management Service Center, Denver.

Juris, Frances
1975 Old Crook County: The Heart of Oregon. Prineville Print Shop, Prineville, Oregon.

Juris, Frances, and John F. Due
1968 Rails to the Ochoco Country: The City of Prineville Railway. Golden West Books, San Marino.

Kam Wah Chung Company
n.d. Company Papers. Ms.3058 on file, Oregon Historical Society, Portland.

Kane, Paul
1859 Wanderings of An Artist Among the Indians of North America. Longman, Brown, Green, Longmans, and Roberts, London.

Katz, Steven, T. L. Bedortha, and R. L. Kiser
1982 Boomer Salvage Cultural Resource Evaluation. USDA Forest Service, Ochoco National Forest, Paulina, Oregon. Submitted to USDA Forest Service, Prineville, Oregon.

Kelly, Robert L., and Lawrence C. Todd
1988 Coming into the Country: Early Paleoindian Hunting and Mobility. American Antiquity 53(2):231-244.

Kenny, Edward M.
1981 Leitrim-Donegal Vanguard. Heppner. Copy on file, Oregon Historical Society, Portland.

Kenny, Judith Keyes
1957 The Founding of Camp Watson. Oregon Historical Quarterly 58 (1):4-35.

1963 Early Sheep Ranching in Eastern Oregon. Oregon Historical Quarterly 64 (2):101-122.

Kent, Susan
1980 Pacifism--A Myth of the Plateau. Northwest Anthropological Research Notes 14:125-134.

Keyser, James D.
1980 Proposal for Site Significance Testing Lava Island Rock Shelter. USDA Forest Service, Portland. Submitted to State Historic Preservation Office, Salem.

Keyser, James, Thomas Burge, and Dorothy Fleming
1988 Management Strategy for the Treatment of Lithic Scatter Sites. USDI Forest Service, Pacific Northwest Region.

Kilkenny, Dorothy R.
n.d. Interview by Rick Harmon. 16 vols. Cassettes on file, Oregon Historical Society, Portland.

Kilkenny, John F.
1969 *Shamrocks and Shepherds: The Irish of Morrow County*. Reprinted. Oregon Historical Society, Portland. Originally published 1968, Oregon Historical Quarterly 69:100-147.

1974 Alpine-A School to Remember. *Oregon Historical Quarterly* 75 (3):270-276.

Killinger, J. P.
1885 *The Dalles City Directory for 1884-85, Giving the Name, Business and Address of Every Inhabitant of The Dalles, Together with a Description of Wasco County, a List of Taxpayers, City and County Officials Since 1854, Wool-growers, and other Matters of Interest*, compiled by J. P. Killinger. Published by J. P. Killinger, and Wasco County Sun Printing House, The Dalles, Oregon. Copy on file, Oregon Historical Society, Portland.

Kincaid, Chris
1988 Predictive Modeling and its Relationship to Cultural Resource Management Applications. In *Quantifying the Present and Predicting the Past: Theory, Method, and Application of Archaeological Predictive Modeling*, edited by W. James Judge and Lynne Sebastian, pp. 549-569. USDI Bureau of Land Management Services Center, Denver.

Kliewer, Dorothy, R.
n.d. Nightfires; A Story of the Oregon Country. Ms. 2616 on file, Oregon Historical Society, Portland.

Knapp, Andy
1979 *Synopsis of 1979 Archaeological Team Research*. Oregon Museum of Science and Industry, Portland. Submitted to the National Science Foundation, Washington, D.C.

Knokey, Judy A., and Suzanne Crowley Thomas
1986 *State Clean-up Land Exchange Cultural Resource Survey and Site Evaluation Report*. USDI Bureau of Land Management, Prineville District, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

1986 Rock Creek Mining District (Antone): Upper, Lower and Waterman Ditches. Historic American Engineering Record OR-9. Ms. on file, USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Knuth, Priscilla
1964 Cavalry in the Indian Country, 1864. *Oregon Historical Quarterly* 65 (1):4-118.

1967 *Picturesque Frontier: The Army's Fort Dalles*. Oregon Historical Society Press, Portland.

Kohler, Timothy A.

1988 Predictive Locational Modeling: History and Current Practice. In *Quantifying the Present and Predicting the Past: Theory, Method, and Application of Archaeological Predictive Modeling*, edited by W. James Judge and Lynne Sebastian, pp. 19-59. USDI Bureau of Land Management Services Center, Denver.

Krieger, Alex D.

1938 University of Oregon, Archaeological Reconnaissance, North Central Oregon. Ms. on file, University of Oregon, Eugene.

Kroeber, Alfred L.

1939 Cultural and Natural Areas of Native North America. *University of California Publications in American Archaeology and Ethnology* 38. Berkeley.

Kuykendall, George

1889 A Graphic Account of the Religions or Mythology of the Indians of the Pacific Northwest, Including a History of Their Superstitions, Marriage Customs, Moral Ideas and Domestic Relations, and Their Conception of A Future State, and the Re-habiliment of the Dead. In *History of the Pacific Northwest: Oregon and Washington*, vol. II. Edited by Elwood Evans. North Pacific History Company, Portland.

Landreth, Keith, D. G. Landis, and L. Clark

1984 *Archaeological Investigations at the Rufus Quarry Site, 35SH119, Sherman County, Oregon*. Archaeological and Historical Services 100-38. Eastern Washington University, Cheney.

Langtry, Virgil H.

1976 Interview by Charles Digregorio. Cassette on file, Oregon Historical Society, Portland.

Lasswell, Mark, and Alexy Simmons

1982 *Cultural Resource Reconnaissance and Assessment within the City of Bend Sludge Disposal and Ultimate Effluent Pond Areas*. Becon, Corvallis. Submitted to the City of Bend, Oregon.

Layton, Stanford J.

l988 *To No Privileged Class: The Rationalization of Homesteading and Rural Life in the Early Twentieth-century American West*. Charles Redd Center for Western Studies, Brigham Young University, Provo.

Lebow, Clayton G., and Eric C. Gibson

1990 *Evaluation of the Eagle Crest Site (35DS518), Deschutes County, Oregon*. INFOTEC Research Report No. PNW90-2. Eugene. Submitted to the Prineville District, USDI Bureau of Land Management, Prineville, Oregon.

Lebow, Clayton G., and Richard M. Pettigrew

1989a A Cultural Resource Survey of Land Exchanges in the Oregon Canyon Mountains Area, Malheur County, Oregon. Infotec Research, Inc., Eugene, Oregon. IRI Report No. PNW89-9. Submitted to the Vale District, USDI Bureau of Land Management, Vale, Oregon.

1989b Rehabilitation of a Vandalized Prehistoric Site in the John Day Canyon, Sherman County, Oregon. IRI Report No. PNW89-10. Submitted to the Prineville District, USDI Bureau of Land Management, Prineville, Oregon.

Lee, Daniel, and Joseph Frost

1884 Ten Years in Oregon. New York.

Leininger, Jan

1980 A History of Mosier and its Valley. Ms. on file, Oregon Historical Society, Portland.

Leonard, Willard

1975-
1976 A Boyhood with Sheep in the Oregon Desert. Oregon Historical Quarterly 76(4); 77(1):5-36.

Leonhardy, Frank C., and David G. Rice

1970 A Proposed Culture Typology for the Lower Snake River Region. Northwestern Anthropological Research Notes 4(1):1-29.

Lewis, Meriwether, and William Clark

1904-
1905 Original Journals of the Lewis and Clark Expedition, 1804-1806, vols. 3 and 4, Reuben Thwaites, editor. Reprinted. Dodd, Mead and Co., New York. Originally Published in 1959, Antiquarian Press, New York.

Lewis, W. S., and Paul C. Phillips (editors)

1923 The Journal of John Work, a Chief Trader of the Hudson's Bay Company.... Arthur H. Clark Co., Cleveland.

Lindberg-Muir, Catherine

1988 Obsidian: Archaeological Implications for the Central Oregon Cascades. Master's thesis, Oregon State University, Corvallis.

Lindgren, Waldemir

1901 The Gold Belt of the Blue Mountains of Oregon. United States Geological Survey, Washington, D. C.

Loewenberg, Robert J.

1975 The Missionary Idea in Oregon: Illustration from the Life and Times of Methodist Henry Perkins. In The Western Shore: Oregon Country Essays Honoring the American Revolution, edited by Thomas Vaughn, pp. 151-180. Oregon Historical Society Press, Portland.

Lohse, E.S., and D. Sammons-Lohse

1986 Sedentism on the Columbia Plateau: A Matter of Degree Related to the Easy and Efficient Procurement of Resources. Northwest Anthropological Research Notes 20(2):115-136.

Lord, Elizabeth Laughton

1903 Reminiscences of Eastern Oregon. Irwin Hodson Company.

Loy, William G. (editor)

1976 Atlas of Oregon. University of Oregon Books, Eugene.

Lundell, John

1970 Governmental History of Wasco County, Oregon. Ms. on file, Oregon Historical Society, Portland.

Lyman, R. Lee

1980 Freshwater Bivalve Molluscs and Southern Plateau Prehistory: A Discussion and Description of Three Genera. Northwest Science 54:121-136.

Lyman, R. Lee, Michael A. Gallagher, Clayton G. Lebow, and Mary Kathryn Weber

1983 Cultural Resource Reconnaissance in the Redmond Training Area, Central Oregon. Report to the Oregon Military Department, Salem, and the USDI Bureau of Land Management, Prineville District, Prineville, Oregon. Department of Anthropology, Oregon State University, Corvallis.

Mack, Joanne M.

1975 Cultural Resources Inventory of the Potential Glass Buttes Geothermal Lease Area, Lake, Harney and Deschutes Counties, Oregon. Department of Anthropology, University of Oregon, Eugene. Submitted to USDI Bureau of Land Management, Portland.

Mahar, James

1953 Ethnobotany of the Oregon Paiutes of the Warm Springs Indian Reservation. Unpublished B.A. thesis, Reed College, Portland.

Many Hands

1957 Jefferson County Reminiscences. Binford and Mort, Portland.

Marshall, Alan

1977 Nez Perce Social Groups: An Ecological Interpretation. Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

Marvin, Susan H.

1983 Cultural Resource Sample Survey Design for the Mt. Hood National Forest. In Cultural Resource Inventory Plans: Documenting Inventory Strategies, edited by James D. Keyser, pp. 34-76. Studies in Cultural Resource Management 4. USDA-Forest Service, Pacific Northwest Region, Portland.

Mason, Otis

1896 Influences of Environment Upon Human Industries or Arts. Annual Report of the Board of Regents of the Smithsonian Institution, 1895, pp. 639-665, Washington, D.C.

Masten, Ruth A.

1984 A Cultural Resources Survey of Bonneville Power Administration's Proposed High Voltage Direct Current Test Site, Jefferson County, Oregon. Archaeological and Historical Services Short Report SR-81. Eastern Washington University, Cheney.

1985 A Cultural Resources Survey of the Bonneville Power Administration's Bend Area Support Project, Crook and Deschutes Counties, Oregon. Reports in Archaeology and History SR-85. Eastern Washington University, Cheney.

Mattes, Merrill J.

1988 Platte River Road Narratives: A Descriptive Bibliography...1812-1866. University of Illinois Press, Urbana and Chicago.

Matz, Stephen

1987 The Effects of the Mazama Tephra-Falls: A Geoarchaeological Approach. Master's thesis, Oregon State University, Corvallis.

Mays, Robert

n.d. Biography. Ms. 2289 on file, Oregon Historical Society, Portland.

Mazany, Terry

1980 Contributions to Oregon Archaeology. Oregon Museum of Science and Industry, Portland. National Science Foundation Technical Report.

McArthur, Lewis A.

1937 Article on history of Canyon City. Oregonian. Quotes from an article in The City Journal (Canyon City) of November 9, 1868.

1974 Oregon Geographic Names. Oregon Historical Society, Portland.

McCall, Dorothy L.

n.d. Diaries. Ms. 1509 on file, Oregon Historical Society, Portland.

McCammon, Bruce P.

1980 The Upper Deschutes: A River With a Social Disease. Paper Presented at the R-6 Applied Hydrology for Fish Habitat Improvement and Stream Restoration Workshop (March 10-14, 1980), Eugene, Oregon.

McFarland, Janine

1987 Test Excavations and Evaluation of the Fall River Prehistoric Sites. USDA Forest Service, Deschutes National Forest, Bend, Oregon.

McFarland, Janine

1989 *An Analysis of Two Post-Mazama Prehistoric Flakes Stone Scatters in the Upper Deschutes River Basin of Central Oregon*. Master's Thesis, Oregon State University, Corvallis.

McFarland, Janine R., and Carl M. Davis

1985 *1983 Reconnaissance Survey of Selected Forest Service Lands Along the Deschutes River*. USDA Forest Service, Bend District, Bend, Oregon.

McGillivary, Simon (and others)

1831 Fort Nez Perces Journal. Hudson's Bay Company Archives Ms.B.146/a. Winnipeg.

McKay, William

1869 The Early History of the Dalles. *The Weekly Mountaineer* 5/28:1.

McKeown, Martha

1959 *Come to Our Salmon Feast*. Binfords and Mort, Portland.

McMillan, Sam G.

1974 *The Bunchgrassers, a History of Lexington, Morrow County, Oregon*. Portland.

McNary, Lawrence A.

1934 Route of Meek Cut-Off, 1845. *Oregon Historical Quarterly* 35 (1):1-9.

McNeal, William H.

1953 History of Wasco County. Ms. 436 on file, Oregon Historical Society, Portland.

1965 Railroads Up the Deschutes. Ms. on file, Maupin Public Library, Maupin, Oregon.

1973 History of the Dalles and Wasco County Schools. Ms. on file, Oregon Historical Society, Portland.

1975 A Brief History of the Old Wasco County, Oregon, Pioneers Association: Peeps Through the Curtain of the Past in Wasco County, Oregon. Ms. on file, Oregon Historical Society, Portland.

McPhail, J. D., and C. C. Lindsey

1986 Zoogeography of the Freshwater Fishes of Cascadia (the Columbia System and Rivers North to the Stikine). In *Zoogeography of North American Freshwater Fishes*, edited by Charles Hocutt and E. D. Wiley, pp. 615-637, New York.

Mehringer, Peter J., Jr.

1985 Late-Quaternary Pollen Records From the Interior Pacific Northwest and Northern Great Basin of the United States. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V.A. Bryant and R.G. Holloway, pp. 167-189. American Association of Stratigraphic Palynologists, Dallas, Texas.

Menefee, Leah Collins, and Lowell Tiller
1976-
1979 Cutoff Fever. Oregon Historical Quarterly 77(4):308-40; 78(1):41-72; 78(2):121-57; 78(3):207-50; 78(4):293-331; 79(1):4-50.

Meinig, Donald W.
1968 The Great Columbia Plain: A Historical Geography, 1805-1910. University of Washington Press, Seattle.

Merk, Frederick
1931 Fur Trade and Empire: George Simpson's Journal. Harvard University Press, Cambridge.

Mesiker, Carson C.
n.d. Narrative, 1835-1915. Ms CB M378 on file, University of Oregon Library Special Collections, Eugene.

Messing, John
1979 Public Lands, Politics, and Progressives: The Oregon Land Fraud Trials, 1903-1910." In Public Land Policies, Management and Disposal, edited by P. W. Gates. Reprinted. Arno Press, New York. Originally published, Pacific Historical Review 35 (l):35-66.

Miller, Christopher
1985 Prophetic Worlds: Indians and Whites on the Columbia Plateau. Rutgers University Press, New Brunswick, N.J.

Miller, Mary
1974 Golden Memories of the Paulina Area. Prineville Print Shop, Prineville, Oregon.

Miller, Norma
1929 Early History of Prineville. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Miller, Wick
1986 Numic Languages. In Great Basin, edited by Warren d'Azevedo, pp. 98-106, Handbook of North American Indians, vol. 11, General editor William Sturtevant. Smithsonian Institution, Washington, D.C. Smithsonian Institution, Washington, D.C.

Minor, Rick, Stephen Dow Beckham, Kathryn Anne Toepel, and Ruth L. Greenspan
1987 Prehistory and History of the Ochoco National Forest, Central Oregon. Part I, Overview. USDA Forest Service, Ochoco National Forest Cultural Report 3, Prineville, Oregon.

Minor, Rick, and Thomas Connolly
1979 An Archaeological Evaluation Of Site 35DS55, Deschutes County, Oregon. Oregon State Museum of Anthropology, Eugene, Oregon. Submitted to Northwest Ranch Brokers, Redmond, Oregon.

Minor, Rick, and Kathryn Anne Toepel

1980 *Archaeological Investigations on Kate's Allotment: An Historic Home Site on the Warm Springs Indian Reservation*. University of Oregon, Eugene, Oregon. Submitted to Warm Springs Indian Reservation, Warm Springs, Oregon.

1981 *Archaeological Investigations at Lava Island Rockshelter (35DS86): A Preliminary Report*. Heritage Research Associates Report 5. Heritage Research Associates, Eugene, Oregon.

1983 *Archaeological Testing at the Inn of the Seventh Mountain Lithic Scatters, Deschutes County, Oregon*. Heritage Research Associates Report 22. Heritage Research Associates, Eugene, Oregon.

1984 *Lava Island Rockshelter: An Early Hunting Camp in Central Oregon*. Occasional Papers of the Idaho State University Museum 34. Pocatello.

Minor, Rick, Kathryn Anne Toepel, and Albert C. Oetting

1988 *The Inn of the Seventh Mountain Lithic Scatters: Post-Mazama Hunting Camps in the Cascade Foothills of Central Oregon*. Heritage Research Associates, Eugene, Oregon. HRA Report No. 79. Submitted to The Inn of the Seventh Mountain, Bend, Oregon.

Mitchell, Donald

1983 Seasonal Settlements, Village Aggregations, and Political Autonomy on the Central Northwest Coast. In *The Development of Political Organization in Native North America*. Edited by Morton Fried, pp. 97-107. American Ethnological Society Proceedings, 1979, Washington, D.C.

Monarch Gold Dredging Company

1934-
1936 Paper of the Monarch Gold Dredging Company. Ms. 1510 on file, Oregon Historical Society, Portland.

Monical, Larry

1968 Camp Watson Military Road: Route Research and Recommendations. Ms. on file, Oregon Historical Society, Portland.

Moody, Zenas Ferry

n.d. Papers. Ms. 699 on file, Oregon Historical Society, Portland.

Mooney, James

1896 The Ghost-Dance Religion and the Sioux Outbreak of 1890. *Bureau of American Ethnology Annual Report* 14, pp. 640-1136, Washington, D.C.

Moore, Richard E., and Nadine H. Purrcell (editors)

1981 *Pacific Northwest Americana 1949-1974: A Supplement to Charles W. Smith's Third Edition of 1950*. Binford and Mort, Portland.

Morris, Andrew J., and Andrew M. Goheen

1981 *Test Excavations at Big Baldy #1 (CR-OR-02-796), Grant County, Oregon*. Burns District USDI Bureau of Land Management, Burns, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Morrow County Agent

1920 Farm Bureau Annual Report. Oregon State College Extension Service, Corvallis. Ms. on file, Oregon State Archives, Salem.

1923-1963 Farm Bureau Annual Report. Oregon State College Extension Service, Corvallis. Ms. on file, Oregon State Archives, Salem.

Morrow County Historical Society

1983 *The History of Morrow County, Oregon*. Taylor Publishing Company, Dallas, Texas.

Mosgrove, Jerry L.

1980 *The Malheur National Forest: An Ethnographic History*. Copy on file, USDA Forest Service, Malheur National Forest, John Day, Oregon.

Mudge, Zachariah

1983 *Sketches of Mission Life Among the Indians of Oregon*. Reprint, Ye Galleon, Fairfield.

Murdock, George

1958 Social Organization of the Tenino. *Miscellanea Paul Rivet* I:299-315. Mexico City.

1965 Tenino Shamanism. *Ethnology* 4:165-171.

1980 The Tenino Indians. *Ethnology* 19(2):129-149.

Natural Heritage Advisory Council

1988 *Oregon Natural Heritage Plan*. Natural Heritage Advisory Council to the State Land Board, Salem, Oregon.

Nedry, H. S.

1952 Notes on the Early History of Grant County. *Oregon Historical Quarterly* 53:235-254.

Nelson, C. M.

1973 Prehistoric Culture Change in the Intermontane Plateau of Western North America. In *The Explanation of Culture Change: Models in Prehistory*, edited by Colin Renfrew, pp. 371-390. Duckworth, Liverpool.

Nelson, Herbert B., and Preston E. Onstad (editors)

1965 *A Webfoot Volunteer: The Diary of William M. Hilleary, 1864-1866*. Oregon State University Press, Corvallis.

Newell, Edith
n.d. A History of the Crooked River National Grassland. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Nielsen, Lawrence E.
1987 Juniper Stumps on the Yreka Trail of 1862-1864. *Oregon Historical Quarterly* 88 (1):49-51.

Nielsen, Lawrence E., Doug Newman, and George McCart
1985 *Pioneer Roads in Central Oregon*. Maverick Publications, Bend.

Nielsen, Lawrence E., Deanne M. Nielsen, and Linda Hickel
1987 In *the Ruts of the Wagon Wheel*: *Pioneer Roads in Eastern Oregon*. Maverick Publications, Bend, Oregon.

Nolan, Mary Lee
1985 Recreation Resources and Activities, In *Atlas of the Pacific Northwest*, edited by Jon A. Kimerling and Philip L. Jackson, pp. 124-131. Oregon State University Press, Corvallis.

Norton, Helen, Robert Boyd, and Eugene Hunn
1983 The Klickitat Trail of South-Central Washington: A Reconstruction of Seasonally-used Resource Sites. In *Prehistoric Places on the Southern Northwest Coast*, edited by Robert Greengo, pp. 121-152. Thomas Burke Memorial Museum Research Reports 4, Seattle.

O'Callaghan, Jerry A.
1979 *The Disposition of the Public Domain in Oregon*: *Memorandum of the Chairman to the Committee on Interior and Insular Affairs*, *U*. *S*. *Senate*, *Transmitting a Dissertation*.... Reprinted. Arno Press, New York. Originally, 1951 unpublished Ph.D. dissertation, Stanford University, Palo Alto; and published, 1960, U. S. Government Printing Office, Washington, D .C. Copy on file, Oregon Historical Society, Portland.

1987 The Disposition of the Public Domain in Oregon. *Oregon Surveyor* 15(5):7-10, 12, 16.

Ochoco National Forest
n.d. Inventory of Historical Records. Ms. on file, USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Ogle, George A., and Company
1913 Standard Atlas of Sherman County. Ms. on file, Sherman County Historical Society, Moro, Oregon.

Oliphant, J. Orin
1968 *On the Cattle Ranges of the Oregon Country*. University of Washington Press, Seattle.

Oliver, Herman
1961 *Gold and Cattle Country*. Edited by E. R. Jackman. Binford and Mort, Portland.

Olney, Nathan
n.d. Papers Ms. 759 on file, Oregon Historical Society, Portland.

Ontko, Vera Koch
1973 *Through the Golden Gate of Yesteryear: Life on the Upper Ochoco, 1907 through 1918*. Prineville Print Shop, Prineville.

Opie, John
1987 *The Law of the Land: Two Hundred Years of American Farmland Policy*. University of Nebraska Press, Lincoln.

Oregon Department of Geology and Mines
1939 List of Mines in Oregon. Ms. on file, Oregon State Archives, Salem.

Oregon Department of Transportation, State Parks and Recreation Branch
1976 Statewide Inventory of Historic Sites and Buildings. Ms. on file, Oregon Historical Society, Portland.

Oregon State Reclamation Commission
n.d. Biennial Reports of the State Reclamation Commission. Ms. on file, Oregon Historical Society, Portland.

Ostler, Jeffrey
1988 The Origins of the Central Oregon Range War of 1904. *Pacific Northwest Quarterly* 79 (1):2-9.

Parker, Samuel
1838 *Journal of an Exploring Tour Beyond the Rocky Mountains, Under the Direction of the A.B.C.F.M., Performed in the Years 1835, 1836, and 1837*.... Ithaca, NY.

Parsons, Col. William, and W. S. Shiach
1902 *An Illustrated History of Umatilla County and of Morrow County, State of Oregon*. W. H. Lever.

Parsons, Jeffrey R.
1972 Archaeological Settlement Patterns. *Annual Reviews in Anthropology* 1:127-150.

Patterson, G. James
1981 *Socio-Economic Overview of the Zone of Influence of the Malheur National Forest in Grant and Harney Counties, Oregon*. Eastern Oregon State College, La Grande, Oregon.

Peck, Lucile Urey
1977 A Certain Time...A Special Place. Ms. on file, Oregon Historical Society, Portland.

Peck, Morton

1961 *A Manual of the Higher Plants of Oregon*. Binfords and Mort, Portland.

Peffer, E. Louise

1951 *The Closing of the Public Domain: Disposal and Reservation Policies, 1900-1950*. Stanford University Press, Menlo Park.

Peters, Lucy Preston Wilson

1930 Memoir of Lucy Preston Wilson Peters, Pioneer of the Dalles, Oregon. Ms. on file Oregon Historical Society, Portland.

Pettigrew, Richard M.

1981 *A Prehistoric Culture Sequence in the Portland Basin of the Lower Columbia Valley*. University of Oregon Anthropological Papers 22. Eugene.

1982 *Archaeological Investigations in Mill Creek Valley, Crook County, Oregon*. University of Oregon Anthropological Papers 26. Eugene.

1983 *Archaeological Investigations at the Wagontire Site (35HA328), Harney County, Oregon*. Oregon State Museum of Anthropology Survey Report 83-4, Oregon State Museum of Anthropology, Eugene.

1984 Prehistoric Human Land-Use Patterns in the Alvord Basin, Southeastern Oregon. *Journal of California and Great Basin Anthropology* 6(1):61-90.

1985 Survey Strategy and Predictive Modeling in the Context of Site Discovery Constraints. In *Archaeological Inventory and Predictive Modeling in the Pacific Northwest*, edited by Richard F. Darsie and James D. Keyser, pp. 21-26. Studies in Cultural Resource Management 6. USDA Forest Service, Pacific Northwest Region, Portland.

Pettigrew, Richard M., and Clayton G. Lebow

1989 *An Archaeological Survey of the Trout Creek-Oregon Canyon Uplands, Harney and Malheur Counties, Oregon*. Infotec Research, Inc., Report PNW89-2. Eugene, Oregon. Submitted to USDI Bureau of Land Management, Vale District, Vale, Oregon.

Pettigrew, Richard M., and Robert L. Spear

1984 *Archaeological Investigations of Two Sites (35DS56 and 57) on the Cascade Lakes Highway, Deschutes County, Oregon*. Oregon State Museum of Anthropology Survey Report 84-2. Oregon State Museum of Anthropology, Eugene.

1987 *Archaeological Reconnaissance West Of Drinkwater Pass Harney County Oregon* Oregon State Museum of Anthropology, Eugene. Submitted to the Oregon Department of Transportation, Salem.

Polk, Michael R.

1976 *Cultural Resource Inventory of the John Day River Canyon*. Bureau of Land Management, Prineville District, Prineville, Oregon.

Polk, Michael R.

1979 Two Conical Timbered Lodges in Central Oregon. Northwest Archaeological Research Notes 13(1):1-8.

Pollentier, Doris A. (editor)

1981 A Souvenir History, Alkali - Arlington, Oregon, 1881-1981. A Serving of History, A Portion of Whimsey. In Arlington, Child of the Columbia, by Marion T. Weatherford. Oregon Historical Society, Portland.

Popek, Gary M.

1984 Maury Creek Restoration Project. USDA Forest Service, Ochoco National Forest, Prineville, Oregon. Submitted to USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

1985 Shakebolt Timber Sale Cultural Resource Inventory. USDA Forest Service, Ochoco National Forest, Prineville, Oregon. Submitted to USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

1987 Preliminary Testing of Four Prehistoric Sites in the Bermuda Timber Sale, Maury Mountains Unit. USDA Forest Service, Ochoco National Forest, Prineville, Oregon. Submitted to USDA Forest Service, Ochoco National Forest, Prineville, Oregon.

Portland Directory Company

1895 Wasco County Directory, Alphabetical and Classified; Together with the Portland Business Directory. Oregon Historical Society, Portland.

Potter, Miles F.

1976 Oregon's Golden Years. Caxton, Caldwell, Idaho.

Potts, James T.

1977 The West of H. L. Davis. Ph.D. dissertation, University of Arizona, Tucson.

Powell, John Wesley

1891 Indian Linguistic Families of America North of Mexico. Bureau of American Ethnology Annual Report 7, 1885-1886, pp. 7-142. Washington, D.C.

Power, Evada R.

1957 Hay Creek. In Jefferson County Reminiscences. Binford and Mort, Portland.

Prairie City Commercial Club

1912 John Day Valley, Oregon. Prairie City Commercial Club, promotional pamphlet, illustrated. Copy on file, De Witt Museum, Prairie City.

Preston, Miles F.

1972 Historical Maps of Oregon. Western Guide Publishers, Corvallis.

Price, Barry A.

1987 Boom Towns and Copper Camps: An Archaeological Survey of Historic Sites in White Pine County, Nevada. Submitted to the State of Nevada Division of Historic Preservation and Archaeology, Carson City, Nevada.

Price, T. D. and J. A. Brown

1985 Aspects of Hunter-Gatherer Complexity. In Prehistoric Hunter-Gatherers, The Emergence of Cultural Complexity, edited by T.D. Price and J.A. Brown, pp. 3-20. Academic Press, Orlando.

Prose, Ralph A.

1947 Reminiscences of Antelope, Oregon. Ms. 1500 on file, Oregon Historical Society, Portland.

Puter, Stephen, A. D., and Horace Stevens

1908 Looters of the Public Domain.... Portland.

Putnam, George Palmer

1915 In the Oregon Country. G. P. Putnam's Sons, New York.

Putnam, M. E.

1977 History of Laidlaw (Tumalo) Oregon. Ms. on file, Tumalo Community Church, Tumalo. Copy in the possession of T. Winch.

Raber, Elizabeth F.

1983 Some Bright Morning. Maverick Publications, Corvallis, Oregon.

Rand, Helen B.

1981 Whiskey Gulch: Letters of G. I. Hazeltine and his Wife, Emeline, Canon Creek, Oregon, 1862-1863 and Later History. Privately Printed. Copy on file, University of Oregon Special Collections, Eugene.

Randle, Keith, Gordon G. Goles, and Laurence R. Kittleman

1971 Geochemical and Petrological Characterization of Ash Samples from Cascade Range Volcanoes. Quaternary Research 1:261-282.

Ray, Verne F.

1936 Native Villages and Groupings of the Columbia Basin. Pacific Northwest Quarterly 27:99-125.

1939 Cultural Relations in the Plateau of Northwestern America. Publications of the Frederick Webb Hodge Anniversary Publication Fund 3. The Southwest Museum, Los Angeles.

1942 Culture Element Distributions XXII: Plateau. Anthropological Records 8(2).

Ray, Verne F., George P. Murdock, Beatrice Blythe, and Omer Stewart

1938 Tribal Distribution in Eastern Oregon and Adjacent Regions. American Anthropologist 40:384-415.

Reagan, Michael J.

1984 *Wallowa-Whitman National Forest Interim Inventory Design: Final Draft*. USDA Forest Service, Wallowa-Whitman National Forest, Baker, Oregon. Submitted to USDA Forest Service, Baker, Oregon.

Rees, Helen Guyton

1982 *Shaniko: From Wool Capital to Ghost Town*. Binford and Mort, Portland.

1983 Shaniko People. Ms. on file, Oregon Historical Society, Portland.

Reid, Kenneth, John Draper, and Peter Wigand

1989 *Prehistory and Paleoenvironments of the Silvies Plateau, Harney Basin, Southeastern Oregon*. Washington State University, Pullman. Submitted to USDA Forest Service, Malheur National Forest, John Day, Oregon.

Renfrew, Colin

1977 Alternative Models of Exchange and Spatial Distribution. In *Exchange Systems in Prehistory*, edited by T. Earle and J. Ericson, pp. 71-90. Academic Press, New York.

Rice, David G.

1972 *The Windust Phase in Lower Snake River Region Prehistory*. Laboratory of Anthropology Report of Investigations, 50. Washington State University, Pullman.

Rich, Edwin Earnest, A. M. Johnson, and Burt Brown Barker (editors)

1950 *Snake Country Journals, 1824-25 and 1825-26*. Hudson's Bay Record Society, London.

Ridgeway School

n.d. Papers of the Ridgeway School, Shaniko. Ms. 1773 on file, Oregon Historical Society, Portland.

Riggs, James W.

1967 Archaeology of the Pine Creek Watershed - A Preliminary Report, 1968. Ms. on file, Camp Hancock, Oregon Museum of Science and Industry, Portland.

1969 *Summary of Archaeological Research in the Pine Creek Watershed, Wheeler County, Oregon*. Oregon State University, Corvallis.

Rigsby, Bruce

1965 *Linguistic Relations in the Southern Plateau*. Ph.D. dissertation, Department of Anthropology, University of Oregon, Eugene.

1966 On Cayuse-Molola Reliability *International Journal of American Linguistics* 32:69-378.

1969 The Waiilatpuan Problem: More on Cayuse-Molala Relatability. *Northwest Anthropological Research Notes* 3:68-145.

Robbins, Kate

1886 Letters. Ms. A105 on file, University of Oregon Library Special Collections, Eugene.

Roscoe, Ernest J.

1967 *Ethnomalacology and Paleoecology of the Round Butte Archaeological Sites, Deschutes River Basin, Oregon*. Bulletin of the Museum of Natural History 6. Museum of Natural History, Eugene, Oregon.

Rosenback, Hank

1982 Smithsonian Project--Relocation of Indian Burial Sites. In *The History of Hood River County, Oregon, 1852-1982*, No. 20-21. Hood River County Historical Society. Taylor Publishing Company, Dalles.

Rosenfeld, Charles L.

1985 Landforms and Geology. In *Atlas of the Pacific Northwest*, edited by Jon A. Kimerling and Philip L. Jackson, pp. 41-47. Oregon State University Press, Corvallis.

Ross, Alexander

1849 *Adventures of the First Settlers on the Oregon or Columbia River*. Smith, Elder, and Company, London.

1956 *The Fur Hunters of the Far West*, edited by Kenneth Spualding. Reprinted. University of Oklahoma Press, Norman. Originally published 1855, Smith, Elder, London.

Ross, Richard Evert

1963 *Prehistory of the Round Butte Area, Jefferson County, Oregon*. Ph.D. Dissertation, University of Oregon, Eugene.

Ruby, Robert H., and John A. Brown

I972 *The Cayuse Indians: Imperial Tribesmen of Old Oregon*. University of Oklahoma Press, Norman.

Rumbaugh, Nora

n.d. Papers. Ms. 2285 on file, Oregon Historical Society, Portland.

Saleeby, Becky M.

1983 *Prehistoric Settlement Patterns in the Portland Basin of the Lower Columbia River: Ethnohistoric, Archaeological, and Biogeographic Perspectives*. Ph.D. dissertation, Department of Anthropology, University of Oregon. University Microfilms, Ann Arbor.

Saleeby, Becky, and Richard M. Pettigrew

1983 Seasonality of Occupation of Ethnohistorically-Documented Villages of the Lower Columbia River. In *Prehistoric Places on the Southern Northwest Coast*, edited by Robert E. Greengo, pp. 169-193. Thomas Burke Memorial Museum Research Reports 4, Seattle.

Samwell, David

1967 Some Account of a Voyage to the South Seas in 1776, 177, 1778. In *The Journals of Captain James Cook*, edited by J. C. Beaglehole, Appendix II 3(2). Hakluyt Society, London.

Sanger, David

1968 Prepared Core and Blade Traditions in the Pacific Northwest. *Arctic Anthropology* 5:1.

Sapir, Edward

1907 Notes on the Takelma Indians of Southwestern Oregon. *American Anthropologist* 9:251-275.

1909 Wishram Texts. *American Ethnological Society Publications*, vol. II.

1910 Wasco. In the Handbook of American Indians North of Mexico, edited by Fredrick Hodge, pp. 917-918. *Bureau of American Ethnology Bulletin* 30, Washington, D.C.

1949 Central and North American Languages. In *Selected Writings of Edward Sapir*, edited by David Mandelbaum, pp. 169-178. University of California Press, Berkeley.

Sawyer, Robert W.

1932 Abbot Railroad Surveys, 1855. *Oregon Historical Quarterly* 33 (1):1-24; (2):115-135.

Scanlon, Brooks

n.d. Papers. Ms. on file, Oregon Historical Society, Portland.

Scarcey, Mildred

1972 *Way Back When*. East Oregonian Publishing Company, Pendleton, Oregon.

1973 *We Remember*. East Oregonian Publishing Company, Pendleton, Oregon.

Schalk, Randall F.

1977 The Structure of an Anadromous Fish Resource. In *For Theory Building in Archaeology: Essays on Faunal Remains, Aquatic Resources, Spatial Analysis, and Systematic Modeling*, edited by Lewis R. Binford, pp. 207-249. Academic Press, New York.

1980 *Project Report Number I: Cultural Resource Investigations for the Second Powerhouse Project at McNary Dam, Near Umatilla, Oregon*. Laboratory of Archaeology and History, Washington State University, Pullman.

1984 The Columbia Plateau Salmon Fisheries: Archaeological Evidence for Intensification. Paper presented at the Annual Meeting of the Society of American Archaeology, April 11-14, Portland.

1986 Estimating Salmon and Steelhead Usage in the Columbia Basin Before 1850: An Anthropological Perspective. *Northwest Environmental Journal* 2(2):1-29.

Schalk, Randall F. (editor)

1987 Archeology of the Morris Site (35GM91) on the John Day River, Gilliam County, Oregon. Prepared by the University of Washington, Office of Public Archaeology, for the U.S. Army Corps of Engineers, Portland District.

Scherzer, Joel

1976 An Areal-Typological Study of American Indian Languages North of Mexico. North-Holland Linguistic Series 20. North-Holland Publishing Company, Amsterdam.

Schmidt, Martin

1971 Catalogue of Manuscripts in the University of Oregon Library. University of Oregon, Eugene.

Schoenberg, Kenneth M.

1976 Phase I Survey of the Bonneville Power Administration Celilo-Sylmar Transmission Line Right-of-Way for Non-Renewable Resources. Department of Anthropology, University of Oregon, Eugene. Submitted to DOE Bonneville Power Administration, Portland.

Scholl, Louis

n.d. Recollections of 60 years. Newspaper article on file, Fort Dalles Museum, Dalles.

Schoning, R. W., T. R. Merrell, and D. R. Johnson

1951 The Indian Dip Net Fishery at Celilo Falls on the Columbia River. Oregon Fish Commission Contribution 17, Portland.

Schwede, Madge

1970 The Relationship of Aboriginal Nez Perce Settlement Patterns to Physical Environment and to Generalized Distribution of Food Resources. Northwest Anthropological Research Notes 4:129-136.

Scott, Leslie M.

1916 Barlow Road, Oregon. Ms. on file, Oregon Historical Society, Portland.

Scott, Sara A.

1983 Sand Spring: A Lithic Workshop on the High Lava Plains. Cultural Resources Report 1. USDA Forest Service, Deschutes National Forest, Bend, Oregon.

1986a A Cultural Resource Survey of the Deschutes River, From Bend to the Deschutes/Jefferson County Line, Deschutes County, Oregon. Sara Scott, Bend, Oregon. Submitted to Deschutes County Community Development Department, Bend, Oregon.

1986b An Analysis of Archaeological Materials Recovered During Test Excavations of Six Prehistoric Sites on the Deschutes National Forest in Central Oregon. Cultural Resources Report 2. USDA Forest Service, Pacific Northwest Region, Portland.

Scott, Sara, Carl Davis, and Jeffrey Flenniken

1986 The Pahoehoe Site: A Lanceolate Biface Cache in Central Oregon. *Journal of California and Great Basin Anthropology* 8(1):7-23.

Secord, Jeanne, M.

1973 Yesterday in Grant County. Grant County Library. Ms. on file, Oliver Museum, Canyon City, Oregon.

Sellards, Elias H.

1952 *Early Man in America*. University of Texas Press, Austin.

Seufert Brothers Company

1916 United States of America vs. Seufert Brothers Company in the District Court of the United States for the District of Oregon, Plaintiffs' Testimony. Ms. on File, Multnomah County Library, Portland, Typescript.

Seufert, Francis A.

1980 *Wheels of Fortune*. Oregon Historical Society Press, Portland.

Shane, Ralph M.

1950 *Early Explorations Through the Warm Springs Reservation Area*. Oregon Historical Quarterly 51:273-309.

Shaniko Leader

1902 Shaniko Leader vol. 2:38. Shaniko Leader, 1902.

Sharp, William H.

1939 A Brief History of Phillip T. Sharp of Oregon. Ms. on file, University of Oregon Library Special Collections, Eugene.

Shaver, F. A., Arthur P. Rose, R. F. Steele, and A. E. Adams

1905 *An Illustrated History of Central Oregon Embracing Wasco, Sherman, Gilliam, Wheeler, Crook, Lake and Klamath Counties, State of Oregon*. Western Historical Publishing Company, Spokane.

1983 *Sherman County: For the Record*. Vol. I:2. Publisher unknown.

Sherar, Joseph Henry

n.d. Account Books of Sherar's Bridge, 1862-1873; 1875-1877. 2 vols. Microform 39 on file, Oregon Historical Society, Portland.

Shiner, Joel

1950 *An Appraisal of the Archeological Resources of the John Day Reservoir on the Columbia River, Oregon and Washington*. Columbia River Project, SI, Washington, D.C. Submitted to Columbia River Project, SI, Washington, D.C.

1953 *Excavations at Site 35-WS-5 on the Columbia River, Oregon*. Columbia River Project, SI, Washington, D.C. Submitted to Columbia River Project, SI, Washington, D.C.

Silvermoon, Jon M.

1985 Purposeful Environmental Manipulation by Non-Agricultural Peoples. Ms. in possession of author.

1989 *A Cultural Resources Survey Addendum for FY 1990 LaPine, Oregon, Timber Sale*. INFOTEC Research, Inc., Eugene. IRI Report No.PNW89-8. Submitted to USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Simpson, Peter K.

1987 *The Community of Cattlemen: A Social History of the Cattle Industry in Southeastern Oregon: 1869-1912*. University of Idaho Press, Moscow.

Skinner, Craig

1986 *The Occurrence, Characterization, and Prehistoric Utilization of Geologic Sources of Obsidian in Central Western Oregon: Preliminary Research Results*. Privately printed, Eugene, Oregon.

Smith, Charles W.

1950 *Pacific Northwest Americana: A Check List of Books and Pamphlets Relating to the History of the Pacific Northwest*. 3rd edition, edited by Isabel Mayhew. Binford and Mort, Portland.

Smith, Frank H., and Brian L. Gannon

1973 Sectioning of Charcoals and Dry Ancient Woods. *American Antiquity* 38(4):468-472.

Snyder, Sandra Lee

1987 *Prehistoric Land Use Patterns in the Central Oregon Cascade Range*. Ph.D. dissertation, Department of Anthropology, University of Oregon, Eugene.

Southworth, Josephine Smith

1977 *Millican Memories*. Bend, Oregon.

Spence, Mary Lee, and Donald Jackson (editors)

1973 *The Expeditions of John Charles Fremont*. 2 vols. University of Illinois Press, Urbana.

Spencer, Lee, and Calvin Schmidt

1989 *The Cal Schimdt Clovis Site*. Lee Spencer Archaeology Paper No. 1989-5. Eugene. Submitted to USDI Bureau of Land Management, Lakeview District, Lakeview, Oregon.

Spier, Leslie

1930 Klamath Ethnography. *University of California Publications in American Archaeology and Ethnology*, volume 30. University of California Press, Berkeley.

1935 *The Prophet Dance of the Northwest and its Derivatives: the Source of the Ghost Dance*. General Series in Anthropology No. 1. George Banta, Menahsa, Wisconsin.

Spier, Leslie
1936 *Tribal Distribution in Washington*. General Series in Anthropology No. 3. George Banta, Menasha, Wisconsin.

Spier, Leslie, and Edward Sapir
1930 Wishram Ethnography. *University of Washington Publications in Anthropology* 3(3):151-300, Seattle.

Spinden, Herbert
1908 The Nez Perce Indians. *American Anthropological Association Memoir* 2:165-274.

State Historic Preservation Office
n.d. *Oregon State Archaeology Data Base: O.S.A.D. Data Manual, Version 1.1*. State Historic Preservation Office, Salem, Oregon.

State of Oregon Census
n.d. Census Records for the State of Oregon. Oregon State Archives, Salem. Microfilm.

State of Oregon
n.d. Litigation Files: Charles M. Pierce vs. Rock Creek Gold Mining Company. Oregon Supreme Court Case files. RG-S5/6IA-20, No. 0368I. Ms. on file, Oregon State Archives, Salem.

Steggell, Norm
1982 An East Central Oregon Forested Highland Occupation from c. 10,000 BP to Historic Times. Paper Presented at the Great Basin Anthropological Conference, Reno, Nevada, October 1, 1982.

1983 A Southern Columbia Plateau Seasonal Lithic Manufacture and Food Processing Site (A 645-0073) was Continuously Occupied Between c. 5,000 BP and Historic Times. Paper Presented at the Northwest Anthropological Conference, Boise, Idaho, March 2, 1983.

Steggell, Norm, K. Sikoryak and J. Sikoryak
1981 *Blue Basin Trail Cultural Resource Inventory Survey in the Sheep Rock Unit John Day Fossil Beds National Monument Grant County, Oregon*. USDI National Parks Service, John Day Fossil Beds National Monument, John Day, Oregon. Submitted to State Historic Preservation Office, Salem, Oregon.

Stephenson, Phillip Mervyn
1982 Interview by Linda Bradley. 2 vols. Cassette on file, Oregon Historical Society, Portland.

Stern, Theodore
n.d. Cayuse, Wallawalla, and Umatilla. In *Plateau*, edited by Deward Walker, Handbook of North American Indians, Volume 12, general editor, William Sturtevant. Smithsonian Institution, Washington, D.C. In press.

Stern, Theodore
n.d. Chiefs and Chief Traders. Ms. in possession of author.

Steward, Julian
1933 Ethnography of the Owens Valley Paiute. University of California Publications in American Archaeology and Ethnology 33:233-350. Berkeley.

1938 Basin-Plateau Aboriginal Sociopolitical Groups. Bureau of American Ethnology, Bulletin 120. Washington, D.C.

1941 Culture Element Distributions, XIII: Nevada Shoshone. University of California Anthropological Records 4(2):209-360. Berkeley.

1943 Culture Element Distributions, XXIII: Nevada and Gosiute Shoshone. University of California Anthropological Records 8(3):263-392. Berkeley.

1970 The Foundations of Basin-Plateau Shoshonean Society. In Languages and Cultures of Western North America, edited by Earl Swanson, pp. 113-151. Idaho State University, Pocatello.

Steward, Julian, and Erminie Wheeler-Voegelin
1954 The Northern Paiute Indians. Paiute Indians III(1974). Garland, New York.

Stewart, Omer C.
1939 The Northern Paiute Bands. Anthropological Records, vol. 2, no. 3. University of California Press, Berkeley.

1941 Culture Element Distributions: XIV. Northern Paiute. University of California Anthropological Records 4(3):361-446. Berkeley.

1942 Culture Element Distributions, XVIII: Ute-Southern Paiute. University of California Anthropological Records 6(4):231-356. Berkeley.

1956 Fire as the First Great Force Employed by Man. In Man's Role in Changing the Face of the Earth, edited by William L. Thomas, pp. 115-133. University of Chicago Press, Chicago.

Stinchfield, Janet L., and McLaren E. Stinchfield
1983 The History of Wheeler County, Oregon. Times-Journal, Condon.

Stivers, Vernon
1934 Saga of the Skyline Trail Recited. The Sunday Oregonian, Magazine Supplement, July, 1, 1934, Portland.

Strong, Emory M.
1959 Stone Age on the Columbia River. Binford and Mort, Portland.

1961 Prehistoric Sculpture From the Columbia River. Archaeology 14(2):131-137.

1969 Stone Age in the Great Basin. Binford and Mort, Portland.

Strong, W. D., W. E. Schenck, and J. H. Steward

1930 Archaeology of the Dalles-Deschutes Region. *University of California Publications in American Archaeology and Ethnology* 29(1). Berkeley.

Strong, William

1945 The Occurrence and Wider Implications of a "Ghost Cult" on the Columbia River, Suggested by Carvings in Wood, Bone, and Stone. *American Anthropologist* 47:44-261.

Stuart, Robert

1935 Robert Stuart's Narratives. In *The Discovery of the Oregon Trail*, edited by Phillip Rollins, pp. 2-263. Scribner's, New York.

Stuemke, Scott

1986 The Odell Lake Site (35-KL-231): An Analysis of a Surface Lithic Scatter Assemblage. In *Contributions to the Archaeology of Oregon, 1983-1986*, edited by Kenneth M. Ames, pp. 48-61. Association of Oregon Archaeologists Occasional Paper 3. Salem, Oregon.

1988 *Ogden Group Camp*. USDA Forest Service, Deschutes National Forest, Fort Rock Ranger District, Bend, Oregon.

1989 *The Archaeology of the Peninsula I Site, 35-JE-53, A Central Oregon Rock Shelter*. Master's thesis, Department of Anthropology, University of Oregon, Eugene.

Suphan, Robert

1974 Ethnological Report on the Wasco and Tenino Indians. *Oregon Indians* II, pp.1-84. Garland, New York.

Swanson, Cynthia, and Amy A. Gowan

1984 *Cultural Resource Reconnaissance Report Shady Timber Sale*. USDA Forest Service, Ochoco National Forest, Prineville, Oregon. Submitted to USDA Forest Service, Prineville, Oregon.

Swift, Lon L.

I909 Land Tenure in Oregon: Including the Topography, Disposition of Public Lands, Landlordism, Mortgages, Farm Output, and Practical Workings of Tenant Farming of the State, Together with Tables and Copies of Land Leases. *Oregon Historical Quarterly* 10 (2):3I-I35.

Swift, Mark

1987 *An Archaeological Survey of Sunriver and Properties to the South Along the Deschutes and Little Deschutes Rivers*. Mark A. Swift. Submitted to Sunriver Properties, Inc., Sunriver, Oregon.

Swindell, Edward

1942 Report on Source, Nature and Extent of the Fishing, Hunting, and Miscellaneous Related Rights of Certain Indian Tribes in Washington and Oregon.... United States Department of Interior, Office of Indian Affairs, Los Angeles.

Symons, Thomas (Engineer in Charge)
1883 Department of the Columbia. Ms. in possession of David Chance.

1887 *Department of the Columbia*. 3rd edition. Oregon Historical Society, Portland.

1892 *Department of the Columbia*. 4th edition. Oregon Historical Society, Portland.

Teit, James
1928 The Middle Columbia Salish. *University of Washington Publications in Anthropology* 2(4):83-128, Seattle.

Thomas, Suzanne Crowley
1982 *Assessment of National Register Eligibility, Bar 71 Land Exchange*. Cultural Resources Report 820511. USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

1986 The Muddy Creek Archaeological Project. *Current Archaeological Happenings in Oregon* 11(2):8.

Thompson, David
1962 *David Thompson's Narrative*, 1784-1812, edited by Richard Glover. Champlain Society, Toronto.

Thompson, H. C.
1944 Reminiscences of Joaquin Miller and Canyon City. *Oregon Historical Quarterly* *45* (4):326-336.

Thouvenel, Marian C.
1952 History of Gilliam County. Ms. on file, Oregon Historical Society, Portland.

Throop, E. Gail
1980 *Historic Resources Evaluation Report Paulina Lake I.O.O.F. Organization Site*. USDA Forest Service, Deschutes National Forest, Bend, Oregon. Submitted to USDA Forest Service, Bend, Oregon.

Todd, Marci Leigh
1982 *Report on the Archaeological Survey of the Proposed Logan Valley Timber Sale/Slash Piling Project*. USDI Bureau of Land Management, Burns District, Burns, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Toepel, Kathryn Anne
1979 *Proposed Testing Program for Archaeological Sites within the Crooked River National Grassland along the BPA Buckley-Summer Lake Transmission Corridor*. Oregon State Museum of Anthropology, Eugene, Oregon. Submitted to DOE Bonneville Power Administration, Portland.

Toepel, Kathryn Anne and Stephen Dow Beckham
1978 *Cultural Resource Inventory of the Brothers EIS Area, Prineville District, Oregon*. Department of Anthropology, University of Oregon, Eugene.

Toepel, Kathryn Anne and Stephen Dow Beckham

1981 Survey and Testing of Cultural Resources Along the Proposed Bonneville Power Administration's Buckley-Summer Lake Transmission Line Corridor, Central Oregon. Bonneville Cultural Resources Group Report No. 100-5. Eastern Washington University Reports in Archaeology and History, Cheney.

Toepel, Kathryn Anne, Robert L. Spear, Robert Lee Sappington, Ruth L. Greenspan, and Paul W. Baxter

1983 Patterns of Prehistory Land Use in Central Oregon: A BPA Transmission Line Study. In Contributions to the Archaeology of Oregon, 1981-1982, edited by Don E. Dumond, pp. 99-122. Association of Oregon Archaeologists, Occasional Papers 2. Portland.

Toepel, Kathryn Anne, William F. Willingham, and Rick Minor

1980 Cultural Resource Overview of BLM Lands in North-Central Oregon: Ethnography, Archaeology, History. University of Oregon Anthropological Papers 17. Eugene.

Townsend, John

1978 Narrative of a Journey Across the Rocky Mountains to the Columbia River.... Reprint, original 1839 H. Perkins, Philadelphia, University of Nebraska Press, Lincoln.

Trafzer, Clifford, and Margery Beach

1985 Smohalla, the Washani, and Religion in Northwestern Indian History. American Indian Quarterly 9(3):309-324.

Turner, Nancy

1977 Economic Importance of Black Tree Lichen (Bryoria fremontii) to the Indians of Western North America. Economic Botany 31:461-470.

1978 Food Plants of the British Columbia Indians, Pt.2: Interior Peoples. British Columbia Provincial Museum Handbook 36, Victoria.

1981 A Gift for the Taking: The Untapped Potential of Some Food Plants of North American Native Peoples. Canadian Journal of Botany 59:2331-2357.

U. S. Army Corps of Engineers

1955 Summary Report On the Indian Fishery at Celilo Falls and Vicinity, Columbia River, 1947-1954. U. S. Army Corps of Engineers, Portland.

United States Department of the Interior

n.d. Correspondences on Military Wagon Roads in Oregon. Film 19 on file, Oregon State Archives, Salem.

United States General Land Office

1851-
1903 Oregon and Washington Donation files. Microfilm M815 on file, National Archives, Washington D. C.

United States General Land Office

1852-1900 Wasco County Donation Land Case Files. Ms. on file, Federal Records Center, Seattle.

1862-1972 Oregon Plat Books. Ms. on file, Federal Records Center, Seattle.

1863-1908 Registers of Oregon Homestead Entries. Ms. on file, Federal Records Center, Seattle.

1866-1947 Registers of Oregon Patents Delivered. Ms. on file, Federal Records Center, Seattle.

1869-1908 Record of Final Oregon Homestead Certificates. Ms.on file, Federal Records Center, Seattle.

1877-1967 Tract Books for Oregon. Ms. on file, Federal Records Center, Seattle.

1900-1978 Unpatented Land Entry Case files, Oregon. Ms. on file, Federal Records Center, Seattle.

n.d. Records. Microfilm RG 49, on file, National Archives, Washington, D. C. Copy on File, Oregon Historical Society, Portland.

United States General Land Office Commissioners

n.d. *Annual Reports of the Commissioner*. Annual Reports of the Secretary of the Interior.

United States Government

1859 Topographical Engineers Map of 1859. Ms. on file, Oregon Historical Society, Portland.

1869 Map of The Dalles Military Road. Ms. on file, Oregon State Archives, Salem.

1871 List of Lands Granted for the Dalles Military Road. Ms. on file, Oregon State Archives, Salem.

n.d. General Land Office Files On file, USDI Bureau of Land Management, Prineville District, Prineville, Oregon.

Unruh, John D., Jr.

1979 *The Plains Across: The Overland Emigrants and the Trans-Mississippi West, 1840-60*. University of Illinois Press, Urbana.

Vaughan, Thomas (editor)

1974 Space, Style and Structure--Building in Northwest America. Oregon Historical Society, Portland.

1981 High and Mighty: Select Sketches About the Deschutes Country. Oregon Historical Society, Portland.

Veazie, Arthur L.

n.d. Letters and Clippings Concerning Crook County, Prineville. Ms. 961 on file, Oregon Historical Society, Portland.

Victor, Frances Fuller

1894 The Early Indian Wars of Oregon Compiled from the Oregon Archives and other Original Sources, with Muster Rolls. Salem.

Villard, Henry

1944 The Early History of Transportation in Oregon, edited by Oswald Garrison Villard. University of Oregon Press, Eugene.

Voorhis, Ernest

1930 Historic Forts and Trading Posts of the French Regime and of the English Fur Trading Companies. Department of the Interior, Natural Resources Intelligence Branch, Ottawa, Canada.

Waitt, Richard B., Jr.

1980 About Forty Last-Glacial Lake Missoula Jokulhlaups Through Southern Washington. Journal of Geology 88:653-679.

Walker, Deward

1967 Mutual Cross-Utilization of Economic Resources in the Plateau: An Example From Aboriginal Nez Perce Fishing Practices. Washington State University Laboratory of Anthropology Report of Investigations 41, Pullman.

1968 Conflict and Schism in Nez Perce Acculturation: A Study of Religion and Politics. Washington State University Press, Pullman.

1969 New Light on the Prophet Dance Controversy. Ethnohistory 16:245-255.

Walker, George W., and Bruce Nolf

1981 High Lava Plains: Brothers Fault Zone to Harney Basin, Oregon. In Guide to Some Volcanic Terranes in Washington, Idaho, Oregon and Northern California, edited by David A. Johnson and Julie Donnelly-Nolan, pp. 105-111. Geologic Survey Circular 838.

Wallen, Captain H. D.

1860 Report of the Secretary of War, Communicating, in Compliance with a Resolution of the Senate, the Report of Captain H. D. Wallen of his expedition, in 1859, from Dalles City to Great Salt Lake, and back.... 36th Congress, Ist Session, Senate Executive Documents 34, Washington, D. C.

Ward, Elizabeth Worrell
1975 *Redmond, Rose of the Desert*. Oregon Historical Society, Portland.

Wasco County
1854-
1864 County Commissioners' Journal. 2 vols. Ms. on file, Oregon State Archives, Salem.

1855 Court Record of Adultery Case Involving Nathan Olney. Ms. on file, Oregon State Archives, Salem.

1855-
1863 Wasco County Court Journal. 1 Vol. Ms. on file, Oregon State Archives, Salem.

1855-
1863 County Probate Court Journal. Ms. on file, Oregon State Archives, Salem.

1855-
1884 Records of Declarations of Intention. Ms. on file, Oregon State Archives, Salem.

1856-
1861 Miscellaneous. Ms. on file, Oregon State Archives, Salem.

1856-
1865 Marriage Records, Book A. Ms. on file, Oregon State Archives, Salem.

1859-
1863 Record of Interstate Estates Ms. on file, Oregon State Archives, Salem.

1860 Divorce Case files. Ms. on file, Oregon State Archives, Salem.

1861-
1865 Sheriff Tax Rolls, and Delinquent Lists. Ms. on file, Oregon State Archives, Salem.

1861-
1893 Married Womens' Separate Property Record. Ms. on file, Oregon State Archives, Salem.

1863-
1875 Jury Book. Ms. on file, Oregon State Archives, Salem.

1866-
1869;
1871-
1872 Tax Assessment Rolls. Ms. on file, Oregon State Archives, Salem.

1872 Military Rolls. Ms. on file, Oregon State Archives, Salem.

Wasco County

1872-
1880 School Land Sales Certificates. Ms. on file, Oregon State Archives, Salem.

1880 Wasco County Census Ms. on file, Oregon State Archives, Salem.

1880-
1881 Court Journal, Fossil. 3 vols. Ms. on file, Oregon State Archives, Salem.

1890 Inventory of Estates. Ms. on file, Oregon State Archives, Salem.

1900 Certificates of Naturalization stubs, early 20th century. Ms. on file, Oregon State Archives, Salem.

1945-
1953 Forest Reserves Rental Receipts. Ms. on file, Oregon State Archives, Salem.

1945-
1953 Taylor Grazing Act Receipts. Ms. on file, Oregon State Archives, Salem, Portland.

n.d. Wasco County Circuit Court files, 1850. ms. on file, Oregon State Archives, Salem.

n.d. Record of Brands. Ms. on file, Oregon State Archives, Salem.

n.d. Case records of Deschutes Road and Bridge Company vs. Antoine Etienne. Ms. on file, Oregon State Archives, Salem.

Wasco County Historical Society

1975 Barlow Road; Bicentennial Edition. Wasco County Historical Society, and Clackamas County Historical Society. Copy on file, Oregon Historical Society, Portland.

Weatherford, Marion T.

1968 Sixteen-mule wheat team, Arlington, Oregon, 1923. *Gazette Times*, Heppner, Oregon.

1974 *Things I See*. Published by Marion T. Weatherford, distributed by Oregon State University Press, Corvallis.

Weatherford, Marion T.

1975 Fields of Amber Grain. In *the Western Shore*, edited by Thomas Vaughan. Oregon Historical Society, Portland.

1977 *Arlington: Child of the Columbia*. Oregon Historical Society, Portland.

Weis, Norman

1972 *Ghost Towns of the Northwest*. Caxton Printers, Caldwell.

Wheeler, Harold E.
n.d. Reminiscences of Shaniko and Antelope, About the 1920's. Ms. 1500 on file, Oregon Historical Society, Portland.

Wheeler-Voegelin, Ermine
1955-
1956 The Northern Paiute of Central Oregon: A Chapter in Treaty Making. *Ethnohistory* 2, 3, pp.95-132, 241-272.

Whiting, Beatrice
1950 Paiute Sorcery. *Viking Fund Publications in Anthropology* 15.

Wigand, Peter Ernest
1987 Diamond Pond, Harney County, Oregon: Vegetation History and Water Table in the Eastern Oregon Desert. *Great Basin Naturalist* 47(3):427-458.

Wilde, James D., Rinita Dalan, Steve Wilke, Ralph Keuler, and John Foss
1983 *Cultural Resource Survey and Evaluations of Select Parcels in the John Day Reservoir, Oregon*. Report to U.S. Army Corps of Engineers, Portland District, by Geo-Recon International, Seattle.

Wildesen, Leslie E.
1984 *Locating Significant Archaeological Sites by Landform Analysis in Central Oregon*. Draft. Oregon State Office and Prineville District, USDI Bureau of Land Management, Portland.

Wilke, Steve, Rinita Dalan, James D. Wilde, K. James, R. Weaver, and D. Harvey
1983 *Cultural Resource Overview and Survey of Select Parcels in The Dalles Reservoir, Oregon and Washington*. Report to U.S. Army Corps of Engineers, Portland District, by Geo-Recon International, Seattle.

Wilkes, Charles
1844 *Narrative of the United States Exploring Expedition*, vols. 4, 5. C. Sherman, Philadelphia.

Williams, Elsie Horn
I983 *A Pictorial History of the Bend Country*. Donning Co., Norfolk, Virginia.

Williams, Howel
1976 *The Ancient Volcanoes of Oregon*. Condon Lectures, Oregon State System of Higher Education, Eugene.

Willig, Judith A., C. Melvin Aikens, and John L. Fagan (editors)
1988 *Early Human Occupation in Far Western North America: The Clovis-Archaic Interface*. Nevada State Museum Archaeological Papers Number 21, Carson City, Nevada.

Willingham, William F.
1982 An Historical Assessment and Recommendations for Management of the Spanish Gulch Mining District, Wheeler County, Oregon. USDI Bureau of Land Management, Prineville District, Prineville, Oregon. Submitted to USDI Bureau of Land Management, Portland.

Wilson, Tillie Davidson
1974 That Was Yesterday; A History of the Town of Sisters, Oregon, and the Surrounding Area. Unknown publisher, Sisters, Oregon.

Winch, Martin T.
1986 Tumalo - Thirsty Land, 1931-1984. Oregon Historical Quarterly 87 (1):21-66.

Wissler, Clark
1914 Material Cultures of the North American Indians. American Anthropologist 16(3):447-505.

Wojcik, Donna
1976 The Brazen Overlanders of 1845. Published by Donna M. Wojcik, Portland.

Wood, W. Raymond
1980 Plains Trade in Prehistoric and Protohistoric Intertribal Relations. In Anthropology in the Great Plains. Edited by Raymond Wood and Margo Liberty, pp.98-109. University of Nebraska Press, Lincoln.

Wood, W. Raymond, and Donald Johnson
1978 A Survey of Disturbance Processes in Archaeological Site Formation. In Advances in Archaeological Method and Theory, vol. 1, edited by Michael B. Schiffer, pp. 315-381. Academic Press, New York.

Works Progress Administration
1937-
1942 Historical Records Survey: Inventory of the County Archives of Oregon. 14 vols. Work Progress Administration, Portland.

Young, F. G.
1899 The Correspondence and Journals of Captain Nathaniel J. Wyeth, 1831-6: A Record of Two Expeditions for the Occupation of the Oregon Country. Oregon Historical Society, Portland.

Zeier, Charles D.
1987 An Archaelogical Inventory and Evaluation in Grantsville Canyon, Nye County, Nevada. Intermountain Research, Silver City, Nevada. Submitted to Coughlin and Associates, Fallon, Nevada.

Zeier, Charles D., and Lou Ann Speulda
1987 A Class III Archaeological Inventory and Evaluation in Weaver Canyon, Pershing County, Nevada. Intermountain Research, Silver City, Nevada. Submitted to Coeur Exploration, Inc., Sparks, Nevada.

Zilverberg, Grace M.

1983 Building Subsistence Models in the Blue Mountain Region of Northeastern Oregon. In *Contributions to the Archaeology of Oregon, 1981-1982*, edited by Don E. Dumond, pp. 123-136. Association of Oregon Archaeologists Occasional Paper 2. Portland.

A CULTURAL RESOURCE OVERVIEW FOR THE 1990s, BLM PRINEVILLE DISTRICT, OREGON

VOLUME II: APPENDIX

by

Clayton G. Lebow

prepared for

Bureau of Land Management, Prineville District
P.O. Box 550
Prineville, Oregon 97754

In partial fulfillment of Contract No. OR952-RFP9-307B

INFOTEC Research, Inc.
205 West Fifth Street
Eugene, OR 97401

May 12, 1990

IRI Report No. PNW90-1

265

APPENDIX: PRINEVILLE DISTRICT ARCSITE DATABASE

As part of their continuing effort to manage cultural resources efficiently, the Bureau of Land Managements (BLM) retained INFOTEC Research, Inc. (IRI), to enter 903 of the Prineville District's site records (representing site records for sites on BLM-administered lands) into BLM's dBASE IV computer database (ARCSITE) file. This database allows quick and reliable manipulation of cultural resource data (such as done in Volume I of this report), which would not be economically feasible with only the hard-copy site records. This appendix is a printout of the resultant ARCSITE file, formatted in WordPerfect 5.0 to give the general appearance of a package of BLM Cultural Resource Site Records.

While the ARCSITE file is an extremely valuable tool for managing cultural resources, it does **not** (nor is it intended to) replace the site report forms completed in the field. In order to create a usable database (one in which the data can be readily manipulated), some pertinent information available on the field forms is not included in the database (such as site location maps or site sketch maps, to use only two examples). Other data are "pigeon-holed" into categories which might not describe the site as accurately as the field forms. Only recently (since mid-1989) has the Bureau of Land Management begun using a site record with fields equivalent to the ARCSITE file; most of the earlier site records either do not contain all the data necessary to complete an ARCSITE record, or have data requiring translation for compatibility. This appendix is not intended to serve as, or replace, the original Cultural Resource Site Record forms.

The purpose of the following discussion is to explain the database, the resultant hard copy, and abbreviations used during data entry. The database file structure itself was provided by BLM, along with guidelines for data entry (Bureau of Land Management 1989). Before describing the individual fields, a few general comments are in order.

1. With two exceptions (**Location** and **Fossil**), the fields are a set length, often necessitating abbreviations or truncated entries. In some cases (particularly in soil), where abbreviating soil series would have created an extraordinarily long list of abbreviations and the truncated word was legible, the word was left truncated.

2. The information was entered as written on the site record, without editing, except for the occasional obvious spelling or grammatical errors, which were corrected. No attempt was made to check the accuracy of the information provided.

3. In most cases, no effort was made to gather data if the information was not available on the site form, in which case the field was left blank. As a result, a number of fields are blank on a large percentage of the database records. If the site recorder answered "none," "N/A," or "unknown" in a field, then this information was also entered during data entry. However, for the following fields, we collected the necessary data if it was not provided on the site forms: **Basin**, **Subbasin**, and **Province**, from Oregon Water Resources Department maps (in State Historic Preservation Office n.d.); the resource area (District) where the site is located, using maps provided by the BLM; and **Plant Community** by cross-referencing the vegetation types recorded on the site forms with the province-specific dominant plant community identified in the Oregon Natural Heritage

266

Plans (Natural Heritage Advisory Council 1988). For other fields (the landform fields and **Site Type**) it usually was necessary to translate the information on the site forms in order to provide the best fit with allowable entries in the ARCSITE file. Originally, we were requested to leave **District** blank, but later were asked to derive this information (Crowley-Thomas, personal communication 1989). As a result, **District** on the first 165 site records entered is blank.

4. All character entries in ARCSITE are capitalized (and thus are capitalized in this appendix). To provide clarity in the hard copy, we also enboldened the field names, and underlined the entries.

As a means of allowing individual site records to be located easily in this appendix, the site records are ordered alpha-numerically, first on **Agency No.**, and then on **Permanent No.** In this ordering system, those site records with blank **Agency No.** are placed before those records with entries in that field. All sites have an entry in either **Agency No.** or **Permanent No.**

The following discussion pertains to the individual fields in this appendix. For further information on the database, refer to Bureau of Land Management (1989).

1. **Permanent No.** is the Smithsonian trinomial designation. If no Smithsonian number was included on the site form, this field was left blank. In a large number of the forms, the state and county codes (with no unique site number) were on the form, and, as this provides the only county designation in the ARCSITE file, this information was entered.

2. **Agency No.** is the temporary site number assigned by BLM or their agents in the field.

3. **Polynum** refers to a GIS polygon label (not currently available on the Prineville District), and is always blank here.

4. The resource area within which the site is located is indicated in the **District** field. The Prineville District has two such areas: The Deschutes Resource Area (designated 05DRA), and the Central Oregon Resource Area (05CORA). The "05" in each abbreviation is the numeric designation for the Prineville District.

5. **Site Name** is self-explanatory.

6. **Owner**, as the name indicates, refers to ownership of the site. The following abbreviations are used here: BLM = Bureau of Land Management; PVT = Private; ST = State; ??? = unknown.

7. **Legal Description** is entered only to the nearest quarter-quarter section.

8. **UTM** contains the Zone, followed by six digits for the easting, and seven digits for the northing.

9. **USGS Quadrangle** is self-explanatory; all maps are in Oregon.

267

10. Information on the site's location and physiographic setting not found in other fields is included in **Location**. If specific access information was included on the site form, it also was entered. If narrative for this field was missing or overly terse on the site form, and a sketch map was provided, an attempt was made to derive useful information from the sketch map to include in this field. The narrative was entered as written on the site forms, which often were cryptic.

11. **Basin, Subbasin**, and **Drainage** refer to the hydrologic setting. If this information was not included on the site form, we derived **Basin** and **Subbasin** by locating each site on maps created by the State of Oregon Water Resources Department (in State Historic Preservation Office n.d.). Two basins in the project area (Malheur, and Goose and Summer Lakes) do not have sub-basins, and thus **Subbasin** may be blank.

    Drainage caused some confusion. Originally, in this field we entered the nearest stream as recorded on the site form. However, after discussions with the Prineville District Archaeologist and re-examining the guidelines (Bureau of Land Management 1989), we determined that **Drainage** is to be derived from, and consistent within, a regionally established drainage system. As we did not have information regarding a drainage system, and it was beyond the contract scope-of-work to determine each site's drainage, this field was left blank (with the exception of a few early entries). When the site was on or near a major river (such as the Deschutes, John Day, Little Deschutes, or Crooked rivers), we thought it safe to assume that the drainage was the river.

12. As instructed in the guidelines (Bureau of Land Management 1989), the physiographic **Province**, if not included on the site form, was derived from the classification of provinces shown in Figure 2 of the *Oregon Natural Heritage Plan* (Natural Heritage Advisory Council 1988). The BLM guidelines list High Lava Plains and Columbia Basin as two different provinces, while the *Oregon Natural Heritage Plan* incorporates the two into a single province (High Lava Plains and Columbia Basin). The later system is used here.

13. **Elevation** is given in feet, as on the original forms and available maps.

14. **Primary Landform** and **Secondary Landform** and their corresponding **Position** refer to the landforms associated with the site, with "primary" indicating the dominant landform, and "secondary" referring to the immediate topographic setting. The entries are selected from multiple-choice options provided in the guidelines (Bureau of Land Management 1989). If there was no information on the site record regarding the landforms, or if the information had no equivalent among the multiple-choice options, these fields were left blank. If possible, we translated the data on the site form to fit an allowable entry; in some instances, topographic maps attached to the site forms were used to determine landforms, while in other instances the authors were aware of the topographic setting of the site. The only abbreviation associated with these fields is "Inter." (Intermittent), used in **Secondary Landform**.

15. **Slope** is self-explanatory.

16. **Aspect** is entered as one of the four cardinal directions, while **Bearing** is the aspect indicated in degrees (so that an aspect of southeast would be entered in **Aspect** as either S or E, and in **Bearing** as 135).

17. **Plant Community** refers to the element name of the dominant plant community for each physiographic province as defined in the Oregon Natural Heritage Plan (Natural Heritage Advisory Council 1988). When this specific information was not provided on the site form, we selected **Plant Community** by cross-referencing the vegetation types listed on the site form with the province.

18. **Watersource** is the type of water nearest the site as listed on the site form; this includes extinct and intermittent sources of water. The abbreviation "Int" (Intermittent) is used frequently in this field. **Dist. to Water** is the distance from the site to the source of water, in meters.

19. **Soil** was entered as written on the site form. In a large number of cases, the soil description was too long to fit within the field, so the following abbreviations were used:

L = Loam
SD = Sand
SI = Silty
LO = Loamy
ST = Stony
CO = Cobbley

C = Clay
SL = Silt
SA = Sandy
CL = Clayey
GR = Gravelly

Multiple abbreviations in the same field were entered without spaces, such that stony loam became "STL," and silty sand became "SISD."

20. **Shpotype** is a field included for State Historic Preservation Office purposes, and is always blank here.

21. **Site Type** was selected from the options listed in the guidelines (Bureau of Land Management 1989); the options we used are listed here, along with our defining criteria (we emphasize that these are the criteria **we** used to select site types -- the guidelines provide no such criteria).

    1. Artifact Scatter. These sites are featureless concentrations of historic or prehistoric cultural debris.
    2. Midden. These are featureless sites, including both shell middens and sites with anthropic, organic-darkened soil.
    3. Rock Feature. Sites that consist of concentrations of rocks, such as cairns or alignments, are included in this type.
    4. Shelters/Cave. This site type encompasses rock shelters and caves.
    5. Quarry. Sites where raw lithic material was extracted are included in this type.
    6. Open Site. These sites have features such as housepits.
    7. Rock Art. This type includes both pictographs and petroglyphs.

8. Burial. A site consisting only of a human burial is meant here. Sites for which other characteristics were most prominent on the recordation, but include burials or human remains as well, were placed with other site types.
9. Other. This category is included for those sites that fit no other category, such as peeled trees or corrals.
10. Architectural Structure (Arch Struct). This type was applied to those sites where the emphasis during site recordation was on describing a structure (or structures).
11. Engineering Structure (Engineering Struct). This type applies to those sites where engineering skill was necessary for construction of the site (such as railroad beds, ditches, canals, tunnels, reservoirs).

In most cases it was necessary to translate either the site type or the site description listed on the site form into an allowable entry. For prehistoric sites, this was usually straightforward (e.g., a lithic scatter equals an artifact scatter, a housepit village is an open site, etc.). However, complex sites often required subjective decisions. For instance, what is the site type for a rockshelter site with rock art on the walls? Or for an artifact scatter with talus pits and burials? For historic sites, this translation often was difficult, particularly when distinguishing between an architectural structure and an artifact scatter when the site consists of a collapsed or partially collapsed structure (if a structure was not at least partially collapsed, it usually was considered to be an architectural structure site). The determining criterion we used in each case when the site type was not obvious was based on the emphasis of the site recorder. If the emphasis was on describing structural remains, the site was considered to be an architectural structure; if the emphasis was on describing the rock art, then it was considered a rock art site. Sites with both historic and prehistoric components also created a problem if both were not artifact scatters. This problem was resolved in the same fashion; the type was determined by the emphasis of the recorder.

22. **Fossil** is a list of keywords used to denote the cultural content (features and artifact classes) of the site. Projectile point types are indicated by generic keywords (e.g., Elko Corner-notched and Elko Eared points are listed as Elko); the types entered are those indicated by the recorder. If a typable point was illustrated but not named, we entered the type. For prehistoric sites, where the types of features and artifact classes generally were limited, all features and classes were listed. For historic sites, where the list of artifact classes often was very long, only those artifact classes considered to represent the site period, type, or function were listed.

The following 18 fields are "logical" fields, answered by a simple yes (Y), or no (N).

23. **Collected** is positive if cultural materials were officially collected from the site.

24. If the site was tested through controlled shovel probes or formal test units, then **Tested** is positive.

25. If features are present within the site, then **Features** is positive.

26. The recorded presence of archaeological faunal or floral materials within a site is indicated in **Fauna** and **Flora** by a "Y".

27. A positive response in **RCdates** indicates that the site has been radiometrically dated.

28. **Strata** indicates if the site is known to be vertically or horizontally stratified.

29. **Grounston** is used to indicated if ground-stone tools were observed at the site.

30. An affirmative answer to **Burial** signifies that human remains were noted at the site.

The next nine fields (listed in Table A.1 as defined by the BLM) are chronological indicators. Sites were assigned to a specific time period if the recorder named or illustrated an artifact characteristic of the period.

Table A.1. Chronological Fields on Site Records.

	FIELD	TIME PERIOD	CHARACTERISTIC ARTIFACTS
31.	**Epaleo**	early paleo-Indian	pre-fluted point
32.	**Mpaleo**	middle paleo-Indian	fluted points (Clovis, Folsom)
33.	**Lpaleo**	late paleo-Indian	Windust and Western Pluvial Lakes tradition points
34.	**Earchaic**	early Archaic	Cascade and large side-notched points
35.	**Marchaic**	middle Archaic	large corner-notched and stemmed dart points
36.	**Larchaic**	late Archaic	small arrow points
37.	**Ehistoric**	early historic	pre-contact Euro-American trade goods
38.	**Mhistoric**	middle historic	contact period artifacts
39.	**Lhistoric**	late historic	post-contact period cultural remains

40. **Area** is site area in m^2.

41. **Acres** is **Area** divided by 4047, rounded to the nearest integer. Those sites with less than 0.5 acre were rounded to 1 acre.

42. **Depth** indicates the depth of the cultural deposits in cm.

43. **Excavarea** (excavated area) and **Excavol** (excavated volume) are used to indicate the area (in m^2) and volume (in m^3) of sites that have been formally excavated.

44. **Integrity** signifies the percent of a site that is undisturbed. If an exact percentage was not recorded, we left this field blank (in other words, we did not numerically represent expressions such as "good" or "poor."

45. **Management Objectives** is to be completed by the BLM.

46. We made an entry in **National Register Status** only if a formal determination of eligibility for a site has been made.

47. An affirmative (Y) response to **References** means that the site is referenced in a published or unpublished document. We excluded documents associated with site recordation (i.e., a report describing the survey during which the site was recorded) because most sites are associated with specific survey reports, and a positive response would not indicate if other (non-survey reports) sources refer to the site.

48. **Recorder** indicates the person who recorded the site. If more than one individual recorded the site, only the person listed first on the site form was included.

49. **Recdate** is the date on which the site was recorded. If the site had been recorded more than once, the last recordation date was used. **Enterdate** is the date of data entry into ARCSITE.

BIBLIOGRAPHY

Bureau of Land Management
1989 Automated Site Inventory Data System Oregon/Washington Bureau of Land Management. Oregon/Washington State Office, Bureau of Land Management, Portland.

Natural Heritage Advisory Council
1988 Oregon Natural Heritage Plan. Natural Heritage Advisory Council to the State Land Board, Salem.

State Historic Preservation Office
n.d. Oregon State Archaeology Database: O. S. A. D. Data Manual Version 1.1. State Historic Preservation Office, Salem.

☆U.S. GOVERNMENT PRINTING OFFICE: 1990-791-198/21804

BUREAU OF LAND MANAGEMENT
OREGON/WASHINGTON STATE OFFICE
PORTLAND, OREGON

CULTURAL RESOURCE SERIES

1. Archaeological Investigations at Yaquina Head, Central Oregon Coast. Rick Minor, Kathryn Anne Toepel and Ruth L. Greenspan. 1987.

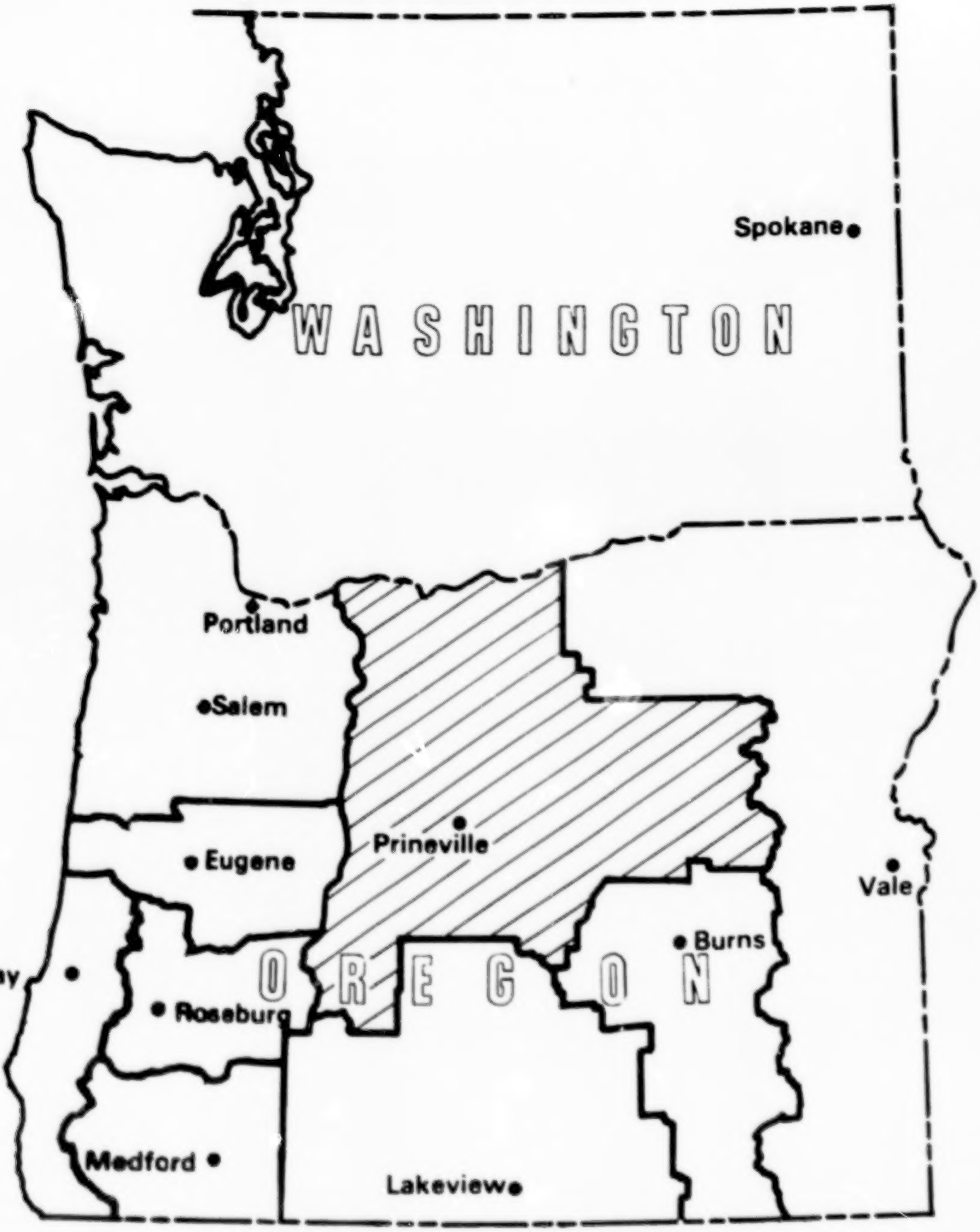
2. An Archaeological Survey of the Trout Creek-Oregon Canyon Uplands, Harney and Malheur Counties, Oregon. Richard M. Pettigrew and Clayton G. Lebow. 1989.

3. Archaeology of the North Yaquina Head Shell Middens, Central Oregon Coast. Rick Minor. 1989.

4. Archaeological Investigations at the Narrows and Martin Creek Sites, Douglas County, Oregon. Brian L. O'Neill. 1989.

5. A Cultural Resource Overview for the 1990s, BLM Prineville District, Oregon. Clayton Lebow, Richard Pettigrew, Jon Silvermoon, David Chance, Robert Boyd, Yvonne Hajda, and Henry Zenk. 1990.

273


WASHINGTON
Spokane
Portland
Salem
Eugene
Prineville
Vale
Burns
Coos Bay
Roseburg
OREGON
Medford
Lakeview

END

11—18—91